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NATIONAL DAM INSPECTION PROGRAM. WHEATLEY DAM (GILBERT RUN WATE--ETC(U)
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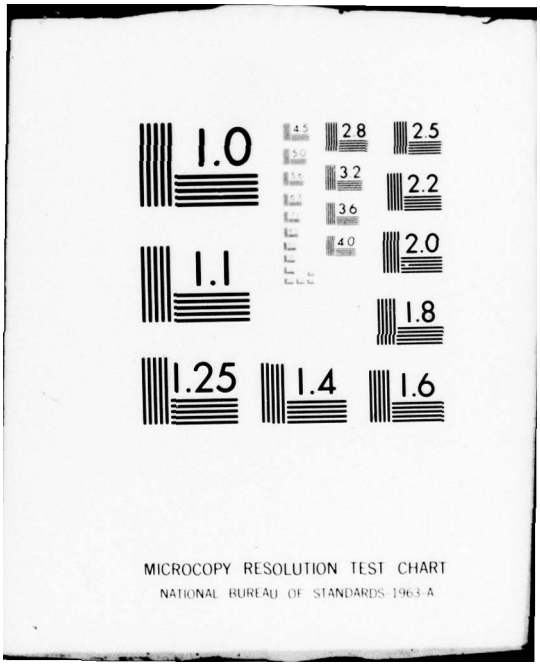
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POTOMAC RIVER BASIN
GILBERT RUN, CHARLES COUNTY

MARYLAND

WHEATLEY DAM

(GILBERT RUN WATERSHED – SITE NO. 2)

NDI ID NO. MD-60

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

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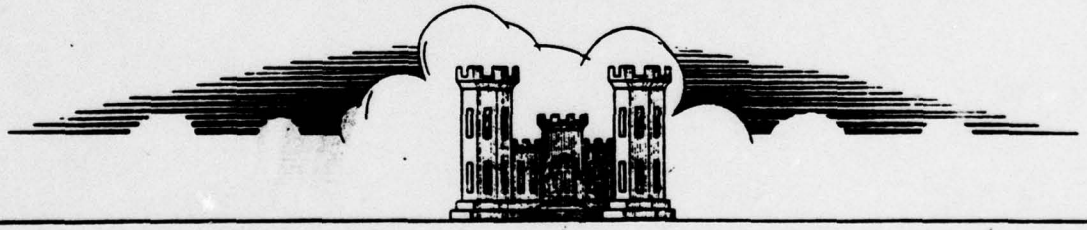

Contract No. DACW31-79-C-0038

PREPARED FOR

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS
BALTIMORE, MARYLAND 21203

BY

ACKENHEIL & ASSOCIATES, ~~BALTIMORE, MD, INC.~~
7902 BELAIR ROAD
BALTIMORE, MARYLAND 21236

JUNE 1979

(6) National Dam Inspection Program.
Wheatley Dam (Gilbert Run Watershed-
Site Number 2) (NDI ID Number MD-60),
Potomac River Basin, Gilbert Run,
Charles County, Maryland. Phase I Inspection Report.

(15) DACW31-79-C-0038

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase 1 investigations. Copies of these guidelines may be obtained from the Department of the Army, Office of Chief of Engineers, Washington, D.C. 20314.

The purpose of a Phase 1 investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon visual observations and review of available data. Detailed investigation and analyses involving topographic mapping, subsurface investigations, material testing, and detailed computational evaluations are beyond the scope of a Phase 1 investigation; however, the inspection is intended to identify any need for such studies which should be performed by the owner.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of the dam depends on numerous and constantly changing internal and external factors which are evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase 1 inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" (PMF) for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential.

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PHASE 1 REPORT
NATIONAL DAM INSPECTION PROGRAM

NAME OF DAM: Wheatley Dam, Gilbert Run Site No. 2
STATE LOCATED: Maryland
COUNTY LOCATED: Charles
STREAM: Wheatley Run, tributary of Gilbert Run
DATE OF INSPECTION: March 22, 1979 and June 6, 1979
COORDINATES: Lat. 38° 29.2', Long. 76° 85.4'

ASSESSMENT OF GENERAL CONDITIONS: Based upon the field reconnaissance and review of design documents and performance history, Wheatley Dam is structurally stable and in good condition at the present time.

The spring located at the toe of the downstream slope near the east abutment is not considered to represent a serious hazard at this time. There is concern that, in the future, increased flow from this spring may cause an internal erosion condition to develop.

The wet zone along the toe of the downstream embankment slope is densely covered with brush, making inspection difficult and possibly concealing other springs or seepage zones which could represent a hazard to the dam embankment. Other deficiencies noted during the field reconnaissance include an inoperable reservoir drain, partially blocked seepage drain outlets, and evidence of movement of the 36 in. dia. R.C. outlet pipe.

According to U.S. Army Corps guideline criteria, Wheatley Dam is classified as an "intermediate" size, "significant" hazard dam. The recommended design storm for a dam of this classification is given as ½ PMF to PMF. The design report, prepared by the Soil Conservation Service, indicates a maximum reservoir elevation 1.0 ft. below top of dam for ½ PMF runoff. It is estimated that the dam can pass 70% to 80% of PMF runoff without the dam being overtopped. The spillway is therefore considered adequate.

The following recommendations should be implemented as soon as possible:

1) Investigation by a professional engineer experienced in the design and inspection of dams should be conducted, on a continuing basis, to evaluate if spring flow is increasing and if embankment or foundation soils are being eroded.

2) Remove all brush cover from the downstream toe area to the embankment. The diversion channel in this area should be re-excavated and lined with coarse aggregate.

3) Repair reservoir drain mechanism.

4) Remove algae growth from the seepage drain outlet pipes. These pipes should be extended to the stilling basin.

5) Periodically inspect the 36 in. dia. outlet pipe section for evidence of continued movement.

6) Develop a more thorough inspection and maintenance program. The program should include frequent exercising and maintenance of the reservoir drain, filling animal burrows on embankment slopes, cutting grass in emergency spillway channel, and removing of brush from the downstream toe area of the embankment.

7) Develop a plan for surveillance of the dam facility for conditions of unusually heavy rainfall. A downstream warning plan should also be developed.

James D. Hainley 29 June '79
James D. Hainley, P.E. Date
Maryland Registration No. 5284
Vice President

Paul A. D'Amato June 29, 79
Paul A. D'Amato Date
Project Engineer

APPROVED BY: James W. Peck 16 July '79
JAMES W. PECK Date
Colonel, Corps of Engineers
District Engineer

WHEATLEY DAM
GILBERT RUN SITE NO. 2

Upstream slope of dam looking west.

Downstream slope of dam looking west.

TABLE OF CONTENTS

PHASE 1 REPORT
NATIONAL DAM INSPECTION PROGRAM
WHEATLEY DAM
NATIONAL I.D. NO. MD 60

1.1 General

a. Authority. The study was performed pursuant to the authority granted by The National Dam Inspection Act, Public Law 92-367, to the Secretary of the Army, through the Corps of Engineers, to conduct inspections of dams throughout the United States.

b. Purpose. The purpose of this study is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project

a. Dam and Appurtenances

1) Embankment. Wheatley Dam was constructed as a zoned earthfill structure. The embankment contains a thin inclined impervious core constructed of compacted silty clay material. The dam is approximately 1,000 ft. long and has a maximum toe to crest height of 39 ft. Upstream and downstream embankment slopes have inclinations of 3H:1V and 2.5H:1V, respectively. A riprap layer for wave protection has been placed on the upstream slope at normal pool level from El. 92.5 to El. 98.0 (3 ft. above normal pool level).

2) Seepage Control Provisions. Seepage control provisions include a cutoff trench and a seepage drain, respectively located 24 ft. upstream and 58 ft. downstream of the dam centerline. Both cutoff trench and seepage drain run the entire length of the dam. Three (3) blanket drains and two (2) perforated corrugated metal pipes discharge seepage collected by the seepage drain at the downstream embankment toe.

3) Flood Discharge Facilities. Flood discharge facilities consist of a principal spillway intake structure with pipe outlet and a 110 ft. wide emergency spillway. The intake structure is made of reinforced concrete and contains two (2) low stage orifices located at normal pool level and two (2) high stage riser crest openings. A 36 in. dia. reinforced concrete pipe is connected to the base of the intake structure and discharges into a stilling basin. The emergency spillway was excavated into natural earth at the left dam abutment.

b. Location. Wheatley Dam is located on Wheatley Run, a tributary of Gilbert Run and the Wicomico River. The dam is located approximately 4 miles southwest of Hughesville, MD. (Refer to Location Plan, Appendix E.)

c. Size Classification. The dam has a maximum storage capacity of 1,850 ac.-ft. and toe to crest height of 39 ft. Based on this criteria, the dam is classified as an "intermediate" size structure.

d. Hazard Classification. Wheatley Dam is classified in the "significant" hazard category. The Wheatley site is used as a county recreational area. In the event of dam failure, damage to the recreational area, state roads, and farmlands would result. The possibility of loss of human life or substantial damage to commercial or residential property is considered slight.

e. Ownership. Wheatley Dam is owned by Charles County. The Charles County Parks and Recreation Department, P. O. Box 368, La Plata, MD 20646, is responsible for operation and maintenance of the facility.

f. Purpose of Dam. Wheatley Dam was constructed for use as a recreational and flood control structure.

g. Design and Construction History. The dam was designed by the Soil Conservation Service, Engineering and Watershed Planning Unit, Upper Darby, PA in 1966. Construction was started on August 8, 1967, and was completed on October 8, 1968. Construction was directed by the Soil Conservation Service.

h. Normal Operating Procedure. Wheatley Dam was designed to operate as an uncontrolled structure. Under normal operating conditions, pool level is maintained by the passage of base flow through the low stage principal spillway orifices.

1.3 Pertinent Data

a. Drainage Area	2.7 sq. mi.
b. Discharge at Dam Facility	
Maximum known flood at dam facility	Unknown
Ungated spillway capacity at design high water elevation	860 cfs
Ungated spillway capacity at top of dam elevation	3,190 cfs
c. Elevation (feet above MSL)	
Constructed top of dam	El. 110.0
Design high water	El. 107.4

Normal pool	El. 95.0
Emergency spillway crest	El. 105.3
Principal spillway high stage	El. 102.5
Principal spillway low stage	El. 95.0
Maximum tailwater	Unknown
Upstream invert of outlet pipe	El. 74.0
Downstream invert of outlet pipe	El. 73.0
Streambed at dam centerline	El. 75.0

d. Reservoir Length

Length of design high water pool	Approx. 1.21 mi.
Length of normal pool	Approx. 0.74 mi.

e. Total Storage

Constructed top of dam	1,850 ac.-ft.
Design high water	1,570 ac.-ft.
Emergency spillway crest	1,365 ac.-ft.
Principal spillway high stage	1,110 ac.-ft.
Principal spillway low stage	579 ac.-ft.
Normal pool level	579 ac.-ft.
Sediment pool	158 ac.-ft.

f. Reservoir Surface

Constructed top of dam	115.0 ac.
Design high water	104.0 ac.
Emergency spillway crest	94.0 ac.
Normal pool	59.0 ac.
Sediment pool	27.5 ac.

g. Dam

Type	Zoned earthfill
Length	1,000 ft.
Height	39 ft.
Top width	15 ft.
Side slopes	
Downstream	2.5H:1V
Upstream (with 10 ft. wide berm)	3.0H:1V
Impervious core	Yes
Cutoff provisions	Compacted cutoff trench
Grout curtain	None

h. Regulating Outlet

Type	Concrete intake riser and 36 in. dia. R.C. outlet pipe
Riser Height	32.2 ft.
Riser Dimensions	
Inside	3.0 x 9.0 ft.
Outside	5.5 x 11.5 ft.
Length of connecting outlet pipe	Approx. 232 ft.
Gates	24 in. dia. slide gate for draining reservoir

i. Emergency Spillway

Type	Earth
Width	110.0 ft.
Crest elevation	105.3 ft.
Gate	None
Upstream channel	Vegetated earth with a negative 2.0% slope
Downstream channel	Vegetated earth with a positive 4.0% slope
Length of channel	500 ft., curved

SECTION 2
DESIGN DATA

2.1 Design

a. Data Available

1) Hydrology and Hydraulics. Design calculations, stage storage curves, discharge rating curves, and flood hydrographs were obtained from Soil Conservation Service Design Report, Gilbert Run Watershed, Wheatley Site dated October 1966. As-built drawings were included with the design report.

2) Embankment. The design report and drawings identified in Section 2.1-a(1) include soil test results, test boring and test pit logs, plans and cross sections, construction specifications and geologist's report. The field engineer's construction report, entitled Engineer's Report and Test Results, Gilbert Run, Wheatley, Site No. 2, prepared by the Soil Conservation Service was also available. Post-construction modifications made for wave protection were obtained from specifications and drawing prepared by the Soil Conservation Service dated August 24, 1971.

3) Appurtenant Structures. The documents identified in Section 2.1-a(2) include design drawings, construction specifications, and design calculations for the principal and emergency spillways.

b. Design Features.

Soil Conservation Service classification "B" ("significant" hazard) design storm criteria and Maryland State requirements were used to design the dam and appurtenances. Illustrations of principal design features are shown in Plates No. 1 through 8.

1) Embankment. The embankment has been constructed as a zoned earthfill structure with soils obtained from on-site borrow areas. The embankment core is inclined, approximately 14 ft. thick, and constructed of compacted silty clay (CL) and clayey silt (ML). Compacted silty sand (SM) was used to construct the shell section for both embankment slopes. (See Plate No. 3.) All embankment soils were compacted to 95% of maximum standard proctor density. Foundation preparation involved clearing, grubbing, and removing of topsoil or unsuitable material. The embankment overlies a 10 to 15 ft. thick silt-sand-gravel alluvial layer and dense clayey silts and sands (Calvert Formation). A riprap berm, located on the upstream slope at normal pool level, was constructed 3 years after the dam was completed to prevent wave erosion.

2) Seepage Control Provisions. An earthfill cutoff trench with 24 ft. wide bottom and 2H:1V side slopes was constructed approximately midway between the upstream embankment toe and centerline. In the valley floor, the trench was excavated to compact green silty sand (Calvert Formation) and varies in depth from 10 to 16 ft. On abutment slopes, the trench was excavated 4 to 6 ft. deep. Trench fill reportedly consists of compacted silty clay. The seepage drain is located approximately 58 ft. downstream of the dam centerline and parallel to the embankment toe. The drain consists of a trench filled with sand and gravel filter material and a 12 in. dia. perforated corrugated metal pipe. The trench measures 4 ft. wide, approximately 13 ft. deep in the valley floor area, and extends up abutment slopes to 15 ft. below top of dam. Seepage, intercepted by the drain, is discharged through two (2) 12 in. dia. non-perforated pipe drains and three (3) blanket drains (see Plate No. 4). A diversion channel for collecting seepage from the blanket drains parallels the toe of the dam.

3) Flood Discharge Facilities. The appurtenant structures consist of a reinforced concrete principal spillway intake structure, outlet pipe, pond drain, and an emergency spillway channel. Details of each spillway are shown in Plate Nos. 1, 3, 5, 6, and 7.

The principal spillway intake structure is constructed of reinforced concrete and contains low and high stage inlets. Two (2) low stage orifice openings, measuring 2 ft. high by 2 ft. wide, are located at normal pool level (El. 95.0). Both orifice openings are protected with a steel trash rack cage. Two (2) high stage riser crest openings are located at El. 102.5. These openings measure 1.5 ft. high by 9.0 ft. wide. The top of the intake structure is covered with a concrete slab for anti-vortex protection. Steel crosspieces serve as trash racks for the high stage riser crest openings. The reservoir drain consists of a slide gate located at the bottom of the intake structure. A 36 in. dia. reinforced concrete outlet pipe with concrete bedding is connected to the bottom of the intake structure and discharges into the stilling basin. Anti-seep collars for the pipe are constructed of reinforced concrete and are spaced 21 ft. on center. A reinforced concrete cradle and bent support the last two outlet pipe sections at the point of discharge.

The emergency spillway is a vegetated natural earth channel excavated into the left dam abutment. Soils in this area are predominately silty sand (SM). The channel is trapezoidal in shape, with a bottom width of 110 ft. and side slopes of 2H:1V. The channel is approximately 500 ft. long with crest located 4.7 ft. (El. 105.3) below top of dam. The emergency spillway discharges approximately

200 ft. downstream of the dam in a direction leading to the natural stream channel. During construction, the design of the emergency spillway was modified by including a tile drain system (see Plate No. 6). It was reported that springs were encountered in this area during excavation.

2.2 Construction. The available design documents and field observations indicate that the dam was constructed in general accordance with the original or modified design drawings and specifications. Modifications include the addition of the riprap berm on the upstream embankment slope and the emergency spillway tile drain system. No unusual construction difficulties were reported.

2.3 Operation. The Charles County Parks and Recreation Department is responsible for the operation of Wheatley Dam. The principal and emergency spillways are uncontrolled structures. No performance or operation records are maintained. The only operational feature is a mechanical slide gate used to provide regulation and drawdown of the reservoir. According to Soil Conservation Service officials, the slide gate is infrequently exercised. This gate was found inoperable at the time of the inspection.

2.4 Evaluation

a. Availability. All available design information and drawings were provided by the Dam Safety Division, Maryland Water Resources Administration and the Soil Conservation Service.

b. Adequacy. The design data provided is reasonably documented and is considered adequate to evaluate the dam and appurtenant structures in accordance with the scope of a Phase 1 study. Based on a review of this data, the dam and appurtenant structures are considered to have been designed in general conformance with accepted engineering practice.

c. Validity. At this time, there is no observable evidence or reason to question the validity of the available design information and drawings.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General. The visual evaluation of Wheatley Dam was based on the following:

1) Observation of earth embankment, abutments, and emergency spillway.

2) Visual examination of exposed sections of the principal spillway intake structure, reservoir drain mechanism, and outlet pipe. An attempt was made to operate the reservoir drain.

3) Observation of reservoir slopes, shoreline and stilling basin.

4) Evaluation of downstream conditions and hazard potential.

The visual surveys were performed during periods when the reservoir was at normal pool level.

In general, visual observations indicate that the dam is in good condition. Deficiencies noted are not considered to represent a hazard to dam stability at the present time. Recommendations for future maintenance and inspection of these areas is given in Section 3.2.

A visual inspection checklist and field sketch are given in Appendix A. Photographs of specific observations are included in Appendix D.

b. Embankment

1) Structural. No significant structural deficiencies of the embankment were discernible.

2) Surficial. Both upstream and downstream embankment slopes have mowed, dense grass covering. Animal burrow holes were observed on the upstream embankment slope. Slightly eroded footpaths were observed along the length of upstream slope at normal pool level (See Photograph 2) and on the upstream slope near the right abutment.

3) Seepage. Springs were observed at the toe of the downstream slope near the left abutment (See Photograph 8) and in the parking lot area approximately 50 ft. downstream of the dam (See Photograph 7). No evidence of internal erosion was observed in these areas.

Water was observed flowing from both 12 in. dia. seepage drain pipe outlets. The outlets of both pipes are partially blocked by algae growth. Blanket drains near abutments and at outlet pipe appear to be functioning. These drains discharge into an interceptor ditch paralleling the downstream embankment toe. This area is wet and densely covered with brush.

4) Wet Zones. A wet zone was observed in the valley floor area along the toe of the downstream embankment slope. A diversion channel in this area receives seepage from two blanket drains located near the left and right abutments. The diversion channel is not well defined. The area is densely covered by brush and tall grass.

c. Appurtenant Structures

1) Principal Spillway. The reinforced concrete intake structure is in good condition. No evidence of cracking or spalling of concrete was apparent on exposed sections. The trash racks are in good condition and were observed to be free of flow obstructions. The slide gate was found to be inoperable.

Evidence of movement was observed at the last pipe joint (at stilling basin) of the 36 in. dia. R.C. outlet pipe. The concrete cradle below this pipe joint has been patched with concrete. Cracks were observed in the bituminous material used to fill the pipe joint.

2) Emergency Spillway. The emergency spillway channel is generally covered with tall, dense grass (see Photograph 4). Trees and brush were observed on the sides of the channel in some areas. Tire ruts were evident along the channel bottom and a footpath has been worn into the grass cover on the right side of the spillway channel.

d. Reservoir Area. No evidence of significant siltation or slope instability was observed during the field reconnaissance. Reservoir slopes have gentle to moderate inclinations and are well covered with trees and vegetation.

e. Downstream Channel. The stilling basin discharges into an outlet channel approximately 10 ft. in width. The sides of the channel are lined with grass and thick brush cover. The tailwater elevation was observed to be about 4 ft. below the invert of the outlet pipe. The channel appears stable and generally free of flow obstructions.

3.2 Evaluation

a. Embankment. The springs and wet zone are not considered to represent a serious hazard to the embankment at the present time. There is concern that the spring located near the left abutment may cause an internal erosion condition to develop. The embankment soils are predominately silty sand (SM) and would be subject to erosion if spring flow increases. The dense brush cover in the wet zone area interferes with inspection and may conceal the presence of springs or seepage zones. This area should be cleared of all brush cover. The discharge of the spring should also be monitored.

The seepage drain outlet pipes do not extend to the stilling basin and are partially blocked by algae growth. Complete obstruction of these outlets will prevent the seepage drain from functioning as intended. The tall grass covering the emergency spillway channel may reduce discharge capacity. This grass cover should be cut periodically. Recommendations are given in Section 7.

SECTION 4
OPERATIONAL FEATURES

4.1 Procedure. Under normal conditions, the reservoir level is maintained by the uncontrolled low stage inlets of the principal spillway riser. The dam operates as an uncontrolled structure. Both principal and emergency spillways are ungated and do not require a dam tender. The only operational feature of the dam is a slide gate, which is used to drain or lower the reservoir.

4.2 Maintenance of Dam. The dam embankment and appurtenant structures are maintained by the Charles County Parks and Recreational Department with the advice of the Soil Conservation Service. Normal maintenance usually involves mowing embankment slopes, applying lime and fertilizer, removing brush and trees, repairing eroded areas, and clearing debris from trash racks.

4.3 Inspection of Dam. The Charles County Parks and Recreational Department is required by the State of Maryland to inspect the dam annually and make needed repairs. Formal inspections have been performed by the Soil Conservation Service at the request of Charles County. The inspections generally consist of visually inspecting the dam embankment, appurtenant structures, and providing repair recommendations.

4.4 Maintenance of Operating Facilities. The reservoir drain slide gate is the only operational feature of the dam. It is not known how often the slide gate is maintenanced and exercised. This gate was found inoperable during our March 27, 1979, field reconnaissance.

4.5 Warning System. No formal flood warning system is in effect.

4.6 Evaluation. Specific improvements in the operation and maintenance procedures in effect at Wheatley Dam are described below:

a. A formal flood surveillance and warning plan is needed for the protection of park users and downstream inhabitants.

b. The spring near the east abutment should be monitored periodically. To facilitate inspection and monitoring, the wet swampy area at the toe of downstream slope should be kept clear of brush and tall grass.

c, Periodically inspect the R. C. pipe outlet section for evidence of movement or joint separation.

SECTION 5
HYDROLOGY/HYDRAULICS

5.1 Evaluation of Features

a. Design Data. Wheatley Dam was designed for flood control and recreational purposes. The Watershed has an area of 1,715 acres and ranges in relief from El. 95 to 200 ft. Watershed cover complex consists of approximately 50% woodlands and 50% pasture and cultivated land. There are no upstream dams present.

The hydrologic/hydraulic analyses contained in the design report were reviewed and found in accordance with accepted engineering practice.

Soil Conservation Service structure classification "B" ("significant" hazard) and Maryland State requirements were used as minimum design criteria for Wheatley Dam. Fifty year sediment accumulation (158 ac.-ft.) and beneficial storage of 421 ac.-ft. (for recreation) were used to set the low stage principal spillway orifices at 15 ft. below the dam crest (El. 95).

The principal spillway was designed to pass a 100 year frequency, 10 day duration design storm without activating the emergency spillway. Calculations, based on design rainfall of 13.0 in./10 days (7.58 in. runoff), indicate a minimum emergency spillway crest elevation of 103.6 ft. This requirement was exceeded by locating the emergency spillway crest at El. 105.3. Design high water conditions were based on a rainfall amount of 11.2 in./6 hr. (Soil Conservation Service structure class "C" or "high" hazard criteria). This design storm was used for design of the emergency spillway channel. Based on this rainfall amount, a peak reservoir elevation of 107.35 ft. (2.65 ft. below top of dam) and maximum channel flow velocity of 5.7 ft./sec. would reportedly occur.

The elevation of top of dam was based on Maryland State criteria. This criteria utilizes the Soil Conservation Service design storm for a class "B" ("significant" hazard) structure and design high water conditions (8.4 in./6 hr. rainfall). Top of dam determination was made by adding 4.4 ft. of freeboard to the maximum reservoir elevation (El. 105.5) resulting from this rainfall amount. Top of dam was thus set at El. 110.

Based on design rainfall of 14.6 in./6 hr., flood routing calculations indicate that the dam would not be overtopped. The maximum reservoir elevation is reported to be 109 ft. (1.0 ft. below top of dam) for this design rainfall.

b. Experience Data. No records of reservoir levels or rainfall amounts are kept. There is no record or report of the emergency spillway ever being activated during periods of heavy rainfall.

c. Visual Observations. As stated previously, no serious appurtenant structure deficiencies were noted during the visual inspections.

d. Overtopping Potential. The Corps of Engineers guidelines recommends design storms of ½ PMF to PMF (Probable Maximum Flood) for "intermediate" size, "significant" hazard dams. These rainfall amounts, for the Wheatley Dam geographical area, are given as 11.2 in./6 hr. and 22.4 in./6 hr., respectively. These values were obtained from Hydrometeorological Report No. 33. (See Appendix C.)

Flood routing calculations for design rainfall of 11.2 in./6 hr. indicate a maximum reservoir elevation of 107.35 ft., or 2.65 ft. below top of dam. The minimum amount of rainfall that would cause overtopping of the dam is not given in the design report.

Manual calculations were made to evaluate if the PMF design storm would overtop the dam. The analysis was made using the Soil Conservation Service Triangular Unit Hydrograph Method with time of concentration (Tc) and curve number (CN) values given in the design report (calculations included in Appendix C). Based on this approximate analysis, the dam would be overtopped by PMF runoff. It is estimated that the dam can accomodate 70% to 80% runoff from PMF rainfall (15.7 in./6 hr. to 17.9 in./6 hr.) without being overtopped.

e. Emergency Spillway Adequacy. Data, previously developed, indicates that reservoir storage and spillway hydraulic capacity is adequate to pass 100% of ½ PMF runoff. The dam and spillways are therefore considered adequate and in accordance with recommended guidelines.

f. Downstream Conditions. Downstream of the dam, Wheatley Run flows through a valley flood plain approximately 500 to 1,500 ft. in width and underpasses State Route No. 6. The area immediately downstream of Wheatley Dam is used as a County recreational area. The only residence downstream of the dam and adjacent to Wheatley Run is located approximately 80 ft. above the floodplain.

Wheatley Run intersects with Gilbert Run approximately 3,500 ft. downstream of the dam. Gilbert Run empties into the Wicomico River eight (8) miles downstream of the dam and passes under State Routes No. 232 and 234. Approximately seven (7) inhabited buildings are located adjacent to and within 2,000 ft. of Gilbert Run. These buildings are located at a minimum elevation difference of 15 ft. above the streambed.

In the event of dam failure, damage to the Gilbert Run Park and State roads is considered likely. Buildings adjacent to Wheatley and Gilbert Run are considered to be sufficiently distant and at high enough elevations to make loss of life improbable. The possibility of loss of life among motorists traveling on Route 6 as a result of dam failure is considered slight.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

1) Embankment. Observations made during the field surveys indicate that the embankment is structurally stable at the present time. There is concern that springs near the toe of the downstream slope may, in the future, affect embankment stability. The dense brush cover in the downstream toe area will make it difficult to access if other springs or seeps develop. This area should be cleared of all brush and be periodically inspected. See recommendations given in Section 7.

The seepage drain pipe outlets were observed to be partially blocked by algae growth. If neglected, these drains could become completely obstructed. Reduced effectiveness of the seepage drain system may cause the phreatic surface of the downstream slope to rise. This condition could reduce embankment stability. See recommendations given in Section 7.

2) Appurtenant Structures. No serious appurtenant structure deficiencies were evident during the field reconnaissance. The end section of the principal spillway outlet pipe should be periodically inspected for evidence of movement and joint separation.

b. Design and Construction Data.

1) Subsurface Exploration. Six (6) test borings and 23 test pits were made in the foundation and abutment areas of the embankment (See Plates No. 2 and 4). Samples and standard penetration tests indicate that the valley floor consists of a stratified alluvial deposit of loose to compact sand, silt, clay, and gravel. The alluvial deposit varies in thickness from 9 to 15 ft. in this area. The alluvium is underlain by predominately compact silty sand with gradual gradational change with depth to silt and clayey silt (Calvert Formation). The abutments and emergency spillway area generally consist of loose to medium compact silty and clayey sand (Sunderland Formation). A zone of loose silty sand colluvium was identified on the east abutment. Ground water levels were found to be at the ground surface in the valley floor area. Active springs were reported at the intersection of valley floor and both abutments.

2) In-Situ Testing. Constant head field permeability tests were performed in three (3) test borings in right abutment and valley floor. Results indicate that foundation soils of the abutment and below the alluvial layer in the valley floor have low permeabilities.

3) Laboratory Testing. Classification, consolidation, permeability, and shear strength tests were performed on selected samples of foundation soils obtained from test pit excavations. Three (3) consolidation tests were performed on undisturbed samples of alluvium and Calvert deposits from the valley floor and Sunderland deposits from the right abutment. For each sample, test results indicate a low consolidation potential under the proposed embankment loading.

Consolidated undrained triaxial tests, using undisturbed samples from the same locations as consolidation tests, yielded shear strength parameters of $\phi = 29.5^0$, c = 700 psf for alluvium; $\phi = 16^0$, c = 450 psf for Sunderland; and $\phi = 28.5^0$, c = 900 psf for Calvert. A cohesive value of 775 psf was reported for one (1) unconfined compression test performed on the alluvial material.

Falling head permeability tests were made on the alluvium and Calvert samples during consolidation testing. Permeabilities (k) of 0.025 ft./day for the alluvium and 0.5 ft./day for the Calvert sample were obtained from a depth of 8.5 ft. This formation was considered to have lower permeability at greater depth as discussed in the design report.

Classification, Standard Proctor, and triaxial tests were performed on samples of borrow material. Triaxial specimens were compacted to 95% of Standard Proctor density and were soaked before testing. Shear streagth parameters obtained from consolidated, undrained tests were $\phi = 18^0$, c = 1,000 psf for the clayey silt (ML) borrow and $\phi = 25.5^0$, c = 550 psf for the silty sand (SM).

4) Slope Stability Analysis. Slope stability of upstream and downstream embankment slopes were evaluated at Sta. 6+15 and 10+85 using the Swedish Circular Arc Method. The embankment and foundation were considered to each be homogeneous materials. The lowest factor of safety against shear failure is reported to be 1.56. This calculation was made using shear strength parameters of $\phi = 25.5^0$, c = 550 psf for the embankment and $\phi = 0^0$, c = 775 psf for the foundaton. Only one (1) trial arc calculation was made for the above conditions.

5) Seepage Analysis. No calculations or references were found to indicate seepage analyses were performed.

6) Settlement Analysis. The embankment was constructed 1.3 ft. above the anticipated crest elevation after settlement. No settlement calculations were found in the design documents to indicate how the estimated amount of settlement was determined. Foundation soils were reported to have low compressibility.

7) Appurtenant Structures. The available principal spillway design drawings and calculations were reviewed for structural adequacy. Based on this review, the basic components of the intake structure are considered structurally adequate.

c. Operating Records. Operating records are not maintained at the dam facility.

d. Post-Construction Changes. Three (3) years after the dam was constructed, riprap was placed on the upstream slope at normal pool level for erosion protection.

e. Seismic Stability. Earthquake conditions were not considered in the stability analysis included in the design report. The dam is in Seismic Zone 1. Based upon past structural performance, visual observations, and static stability analysis, structural stability is presumed to be adequate under earthquake conditions.

SECTION 7
ASSESSMENTS AND RECOMMENDATIONS/PROPOSED REMEDIAL MEASURES

7.1 Dam Assessment

a. Evaluation

1) Embankment. Wheatley Dam is considered to be structurally stable and in good condition at the present time. Seepage drain outlet pipes were observed to be partially blocked by algae growth. The seepage drains were not able to function as they were intended. This condition should be corrected.

2) Seepage. At the present time, the springs noted in Section 3.1-(b)3 are not considered to represent a serious hazard. There is concern that the spring located near the left abutment may cause internal erosion of the embankment and/or foundation soils. The embankment soils are predominately silty sand and would be subject to erosion if spring flow increases.

3) Wet Zones. The wet zone identified in Section 3.1-(b)4, is believed to result from seepage from blanket drains, flow from springs identified in Section 3.1-(b)3, and a high ground water level. This area is densely covered with brush and the diversion channel is not well defined. The dense brush cover interferes with the inspection of this area.

4) Principal Spillway. The principal spillway riser and trashracks are in good condition. The reservoir drain was found inoperable and judged inadequate in its present condition. Evidence of outlet pipe movement identified in Section 3.1-(c)1 is not considered serious at this time.

5) Emergency Spillway. Field reconnaissance and review of design documents indicate that the emergency spillway is stable and in good condition. The tall grass covering the spillway channel may reduce discharge capacity.

6) Flood Discharge Capacity. Based on review of design data, the maximum reservoir elevation resulting from ½ PMF runoff is 1.0 ft. below the dam crest. A ½ PMF to PMF design storm is recommended for this dam facility. It is estimated that the dam can pass 70% to 80% of PMF runoff without being overtopped. The dam and spillways are therefore considered adequate and in accordance with recommended guidelines.

b. Adequacy of Information. The design information and drawings available for this review were of sufficient detail to adequately conduct a Phase 1 study.

c. Necessity for Further Investigation. As previously stated, the possibility exists that the spring located near the east dam abutment may cause an internal erosion condition to develop. Investigation should be made, on a continuing basis, to evaluate if flow is increasing and if embankment soils are being eroded.

d. Urgency. The recommendations and remedial measures presented in this report should be implemented as soon as possible.

7.2 Recommendations/Remedial Measures. The following recommendations are presented based on the data obtained.

a. Dam and Appurtenant Structures

1) Repair slide gate or lifting mechanism of reservoir drain.

2) The seepage drain outlet pipes should be cleared of algae growth and extended to the stilling basin. Having these outlets discharge at the stilling basin rather than at the embankment toe will reduce the possibility of future plant growth obstructing flow.

3) Remove all brush cover from the downstream toe area of the embankment. This area should be periodically inspected for the presence of springs and seeps. The diversion channel should be re-excavated to more readily transmit blanket drain discharge to the stilling basin. Use of coarse aggregate to reline the diversion channel will facilitate future inspection and investigation (see below).

4) An investigation should be conducted to periodically evaluate flow of the spring near the east abutment and along the diversion channel. This can be done by the use of weirs. The source of flow entering the diversion channel should be carefully delineated and evaluated with regard to location and internal erosion potential. Corrective measures should be taken to control the seepage, if the investigation indicates this is necessary. The investigation should be conducted by a qualified professional with expertise in the inspection of earthfill dams.

b. Operation and Maintenance Procedure

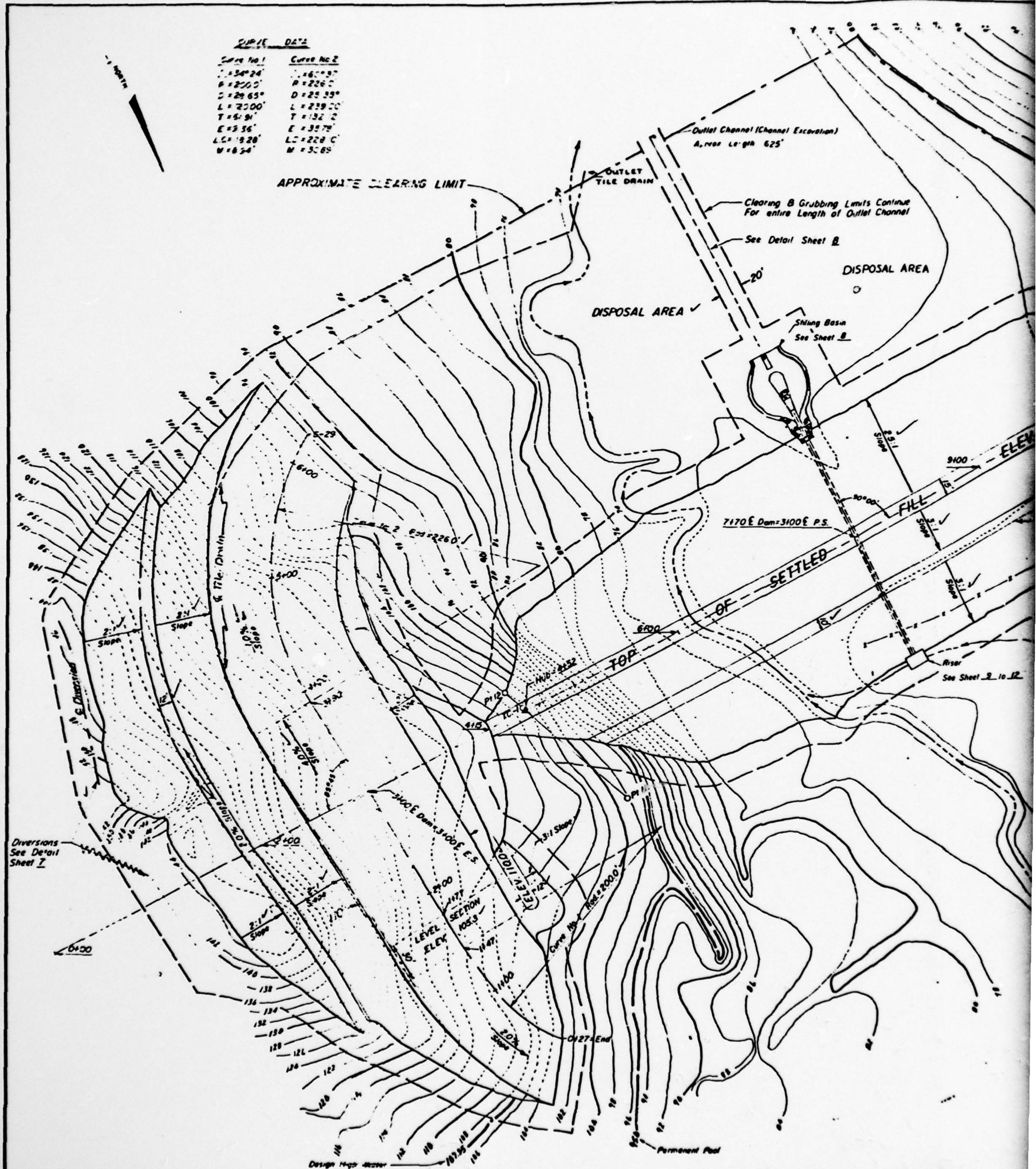
1) Periodically inspect the outlet section of the 36 in. dia. R.C. pipe for continued evidence of movement. Report any change to the Maryland Water Resources Administration and the Soil Conservation Service. Make necessary remedial corrections.

2) Develop a more thorough and active maintenance and inspection program of the dam facility. Program should include frequent exercising and maintenance of the reservoir drain, filling animal burrows on embankment slopes, cutting grass in emergency spillway channel, and removal of brush from the downstream toe area of the embankment.

3) Periodically inspect the seepage drain outlet pipes for flow obstructions and corrosive damage. Make remedial corrections, as conditions require.

4) The operating procedure should include periodic survey of the dam facility during periods of unusually heavy rainfall. A formal downstream warning plan should also be developed.

PLATES



Curve No 2
APPROXIMATE CLEARING LIMIT
OUTLET TILE DRAIN
Outlet Channel (Channel Excavation)
Clearing & Grubbing Limits Continue For entire Length of Outlet Channel
See Detail Sheet 8
DISPOSAL AREA
DISPOSAL AREA
Stilling Basin See Sheet 8
7+70 ℄ Dam=3100 ℄ P.S.
TOP OF SETTLED FILL
Riser See Sheet 9 to 12
℄ Tile Drain
2:1 Slope
3:1 Slope
10% Slope
20% Slope
3100 ℄ Dam=3+00 ℄ E.S.
LEVEL SECTION ELEV 105.3
ELEV 110.0
Diversions See Detail Sheet 7
℄ Diversion
6+00
5+00
Permanent Pool
Design High Water

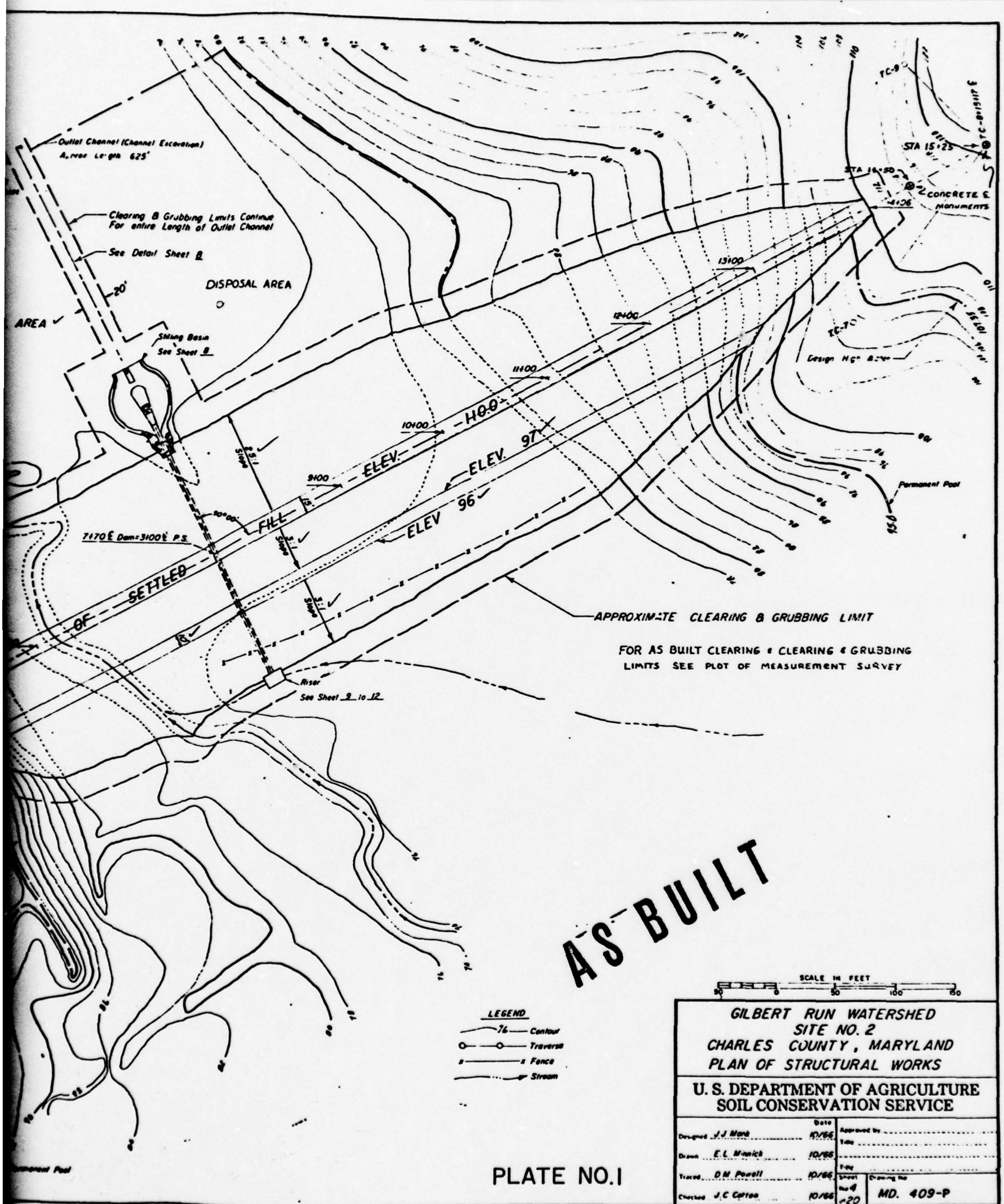
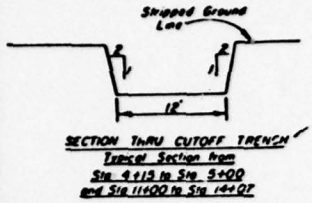
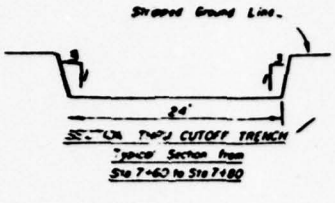

Outlet Channel (Channel Excavation)
Across Length 625'
Clearing & Grubbing Limits Continue For entire Length of Outlet Channel
See Detail Sheet 8
DISPOSAL AREA
AREA
20'
Stilling Basin
See Sheet 8
STA 15+25
STA 14+50
CONCRETE Monuments
13+00
12+00
11+00
10+00
9+00
ELEV. 100
ELEV. 97
ELEV 96
FILL
OF SETTLED
7+70 ℄ Dam = 3+00 ℄ P.S.
Permanent Pool
Design High Water
APPROXIMATE CLEARING & GRUBBING LIMIT
FOR AS BUILT CLEARING & CLEARING & GRUBBING LIMITS SEE PLOT OF MEASUREMENT SURVEY
Riser
See Sheet 9 10 12
AS BUILT
SCALE IN FEET
50 0 50 100 150
LEGEND
76 Contour
Traverse
Fence
Stream
Permanent Pool
GILBERT RUN WATERSHED
SITE NO. 2
CHARLES COUNTY, MARYLAND
PLAN OF STRUCTURAL WORKS
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Designed J.J. Mark 10/66
Drawn E.L. Minnick 10/66
Traced D.M. Powell 10/66
Checked J.C. Cotton 10/66
Approved by
Title
Sheet No 4 of 20
Drawing No MD. 409-P
SCS-313C (9-64)

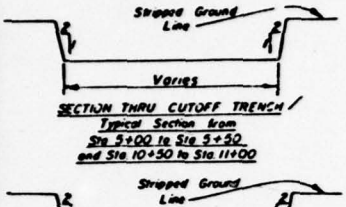
PLATE NO.1



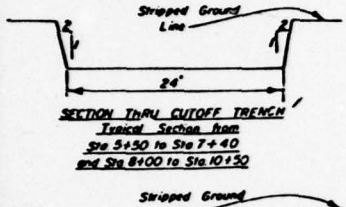
SECTION THRU CUTOFF TRENCH
Typical Section from
Sta 4+15 to Sta 5+00
and Sta 11+00 to Sta 14+07



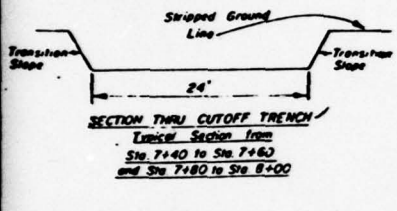
SECTION THRU CUTOFF TRENCH
Typical Section from
Sta 7+60 to Sta 7+80



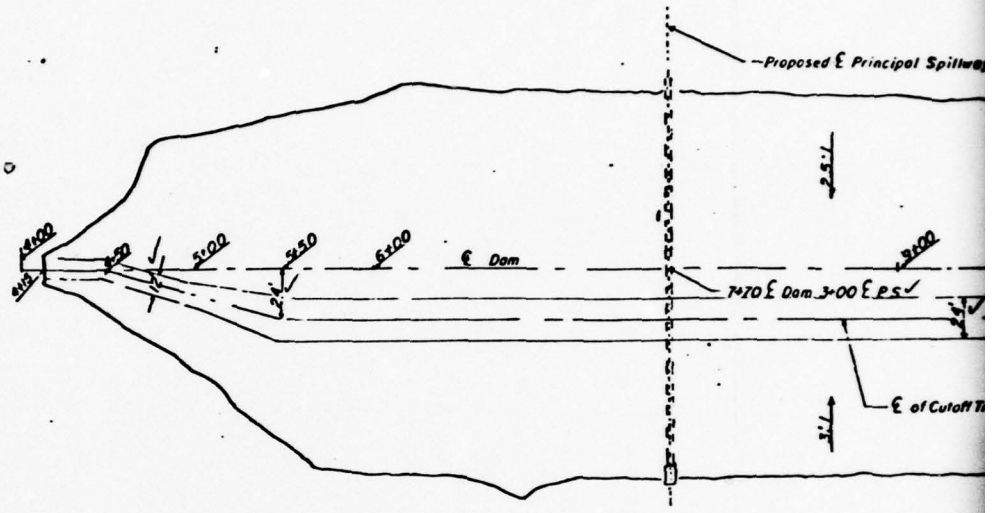
SECTION THRU CUTOFF TRENCH
Typical Section from
Sta 5+00 to Sta 5+50
and Sta 10+50 to Sta 11+00



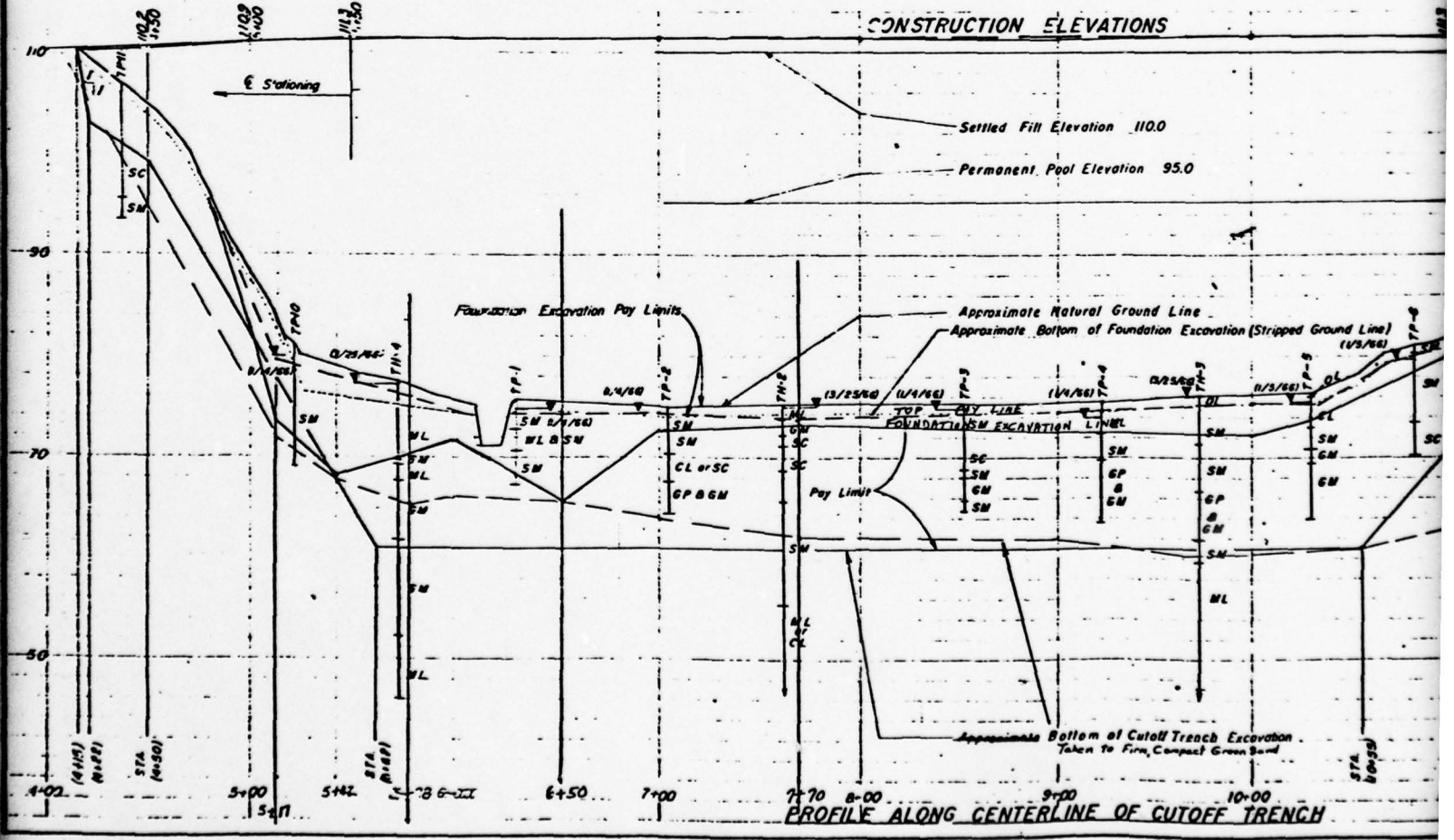
SECTION THRU CUTOFF TRENCH
Typical Section from
Sta 5+50 to Sta 7+40
and Sta 8+00 to Sta 10+50



SECTION THRU CUTOFF TRENCH
Typical Section from
Sta 7+40 to Sta 7+60
and Sta 7+80 to Sta 8+00



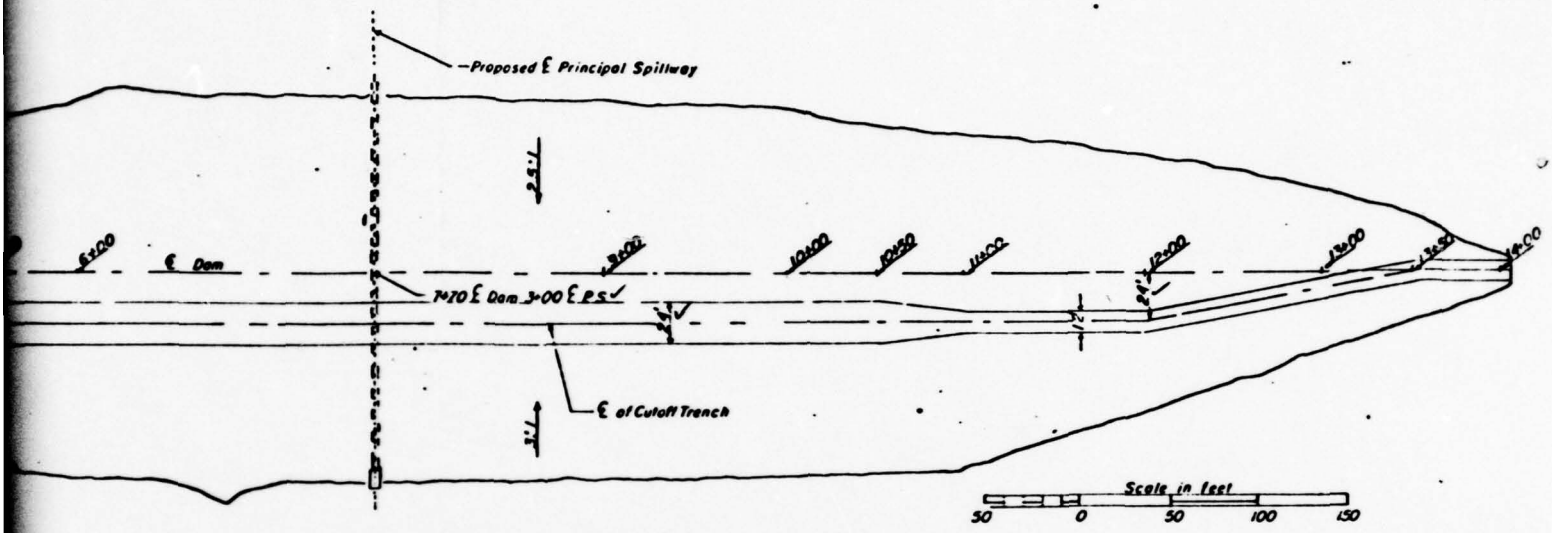
PLAN VIEW OF CUTOFF TRENCH



PROFILE ALONG CENTERLINE OF CUTOFF TRENCH

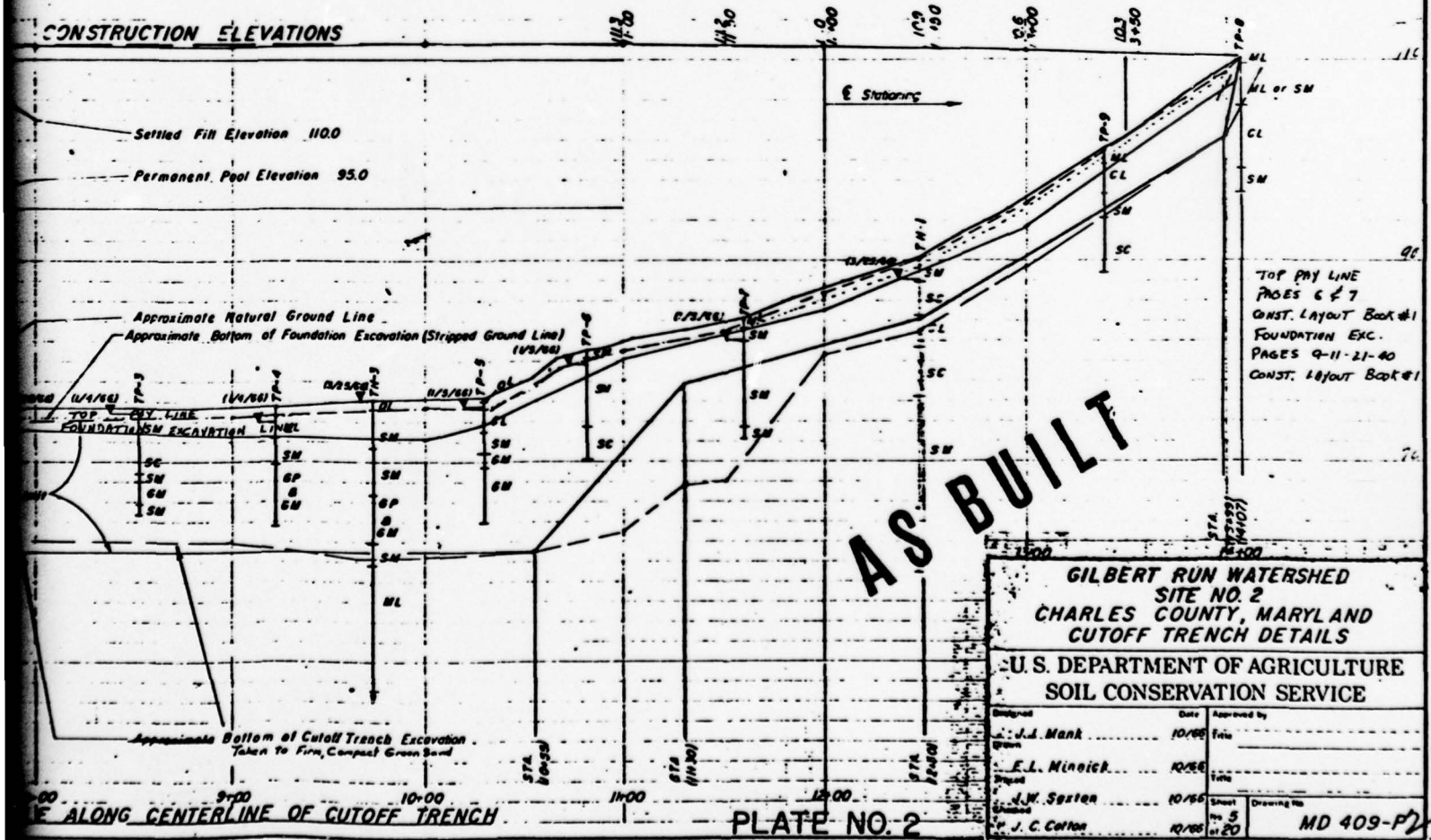
CONSTRUCTION DETAILS

1. The Profiles of the Bottom of All Excavations Shown are Approximate.
2. Required Finished Grades Will Be Established by the Engineer.
3. For Logs of Test Holes, See Sheets 16 to 20



PLAN VIEW OF CUTOFF TRENCH

CONSTRUCTION ELEVATIONS



ALONG CENTERLINE OF CUTOFF TRENCH

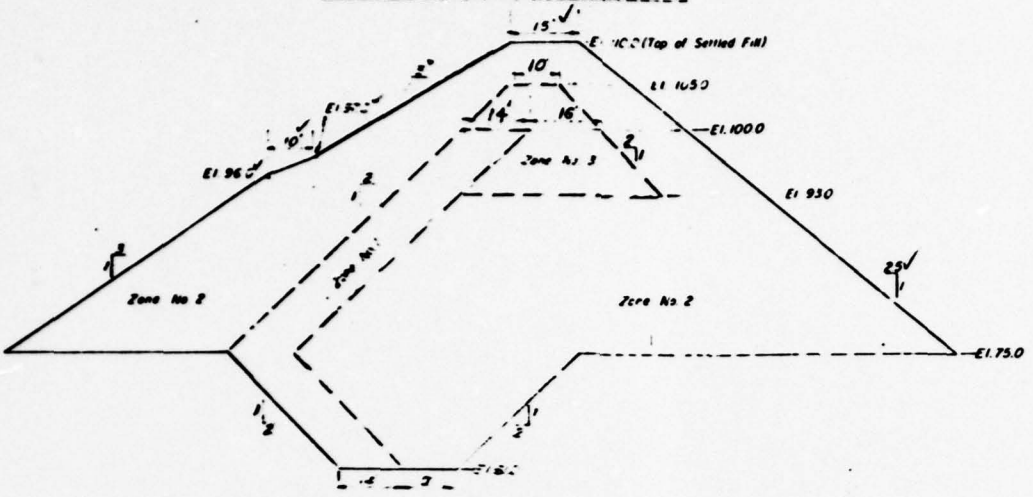
PLATE NO. 2

GILBERT RUN WATERSHED
SITE NO. 2
CHARLES COUNTY, MARYLAND
CUTOFF TRENCH DETAILS

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

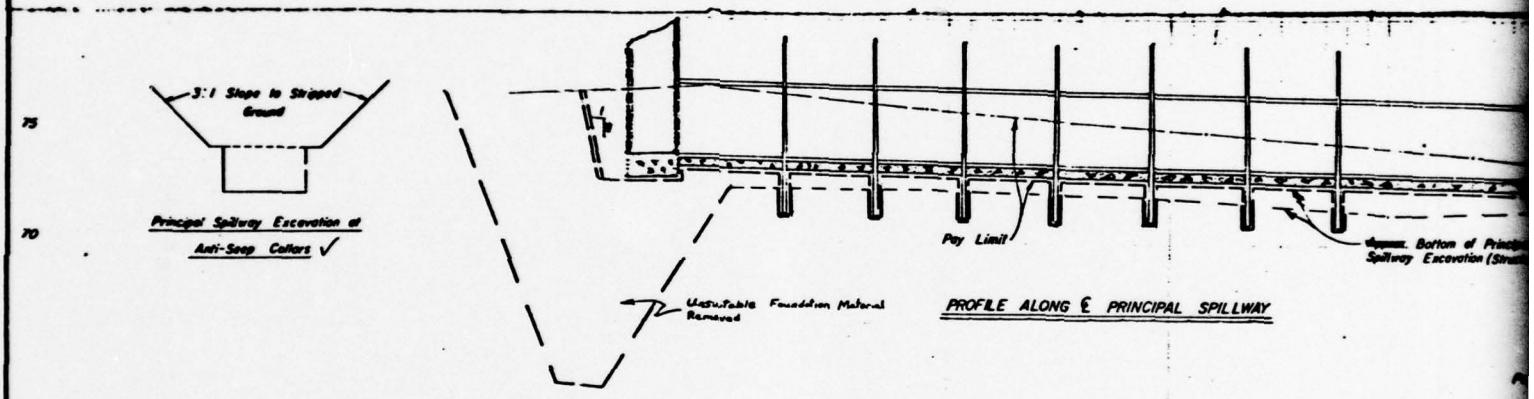
		Date	Approved by
Designed	J.J. Mank	10/66	Title
Drawn	E.L. Minnick	10/66	Title
Traced	J.W. Saxton	10/66	Sheet No. 5 of 20
Checked	Jr. J.C. Cotton	10/66	Drawing No. MD 409-P2

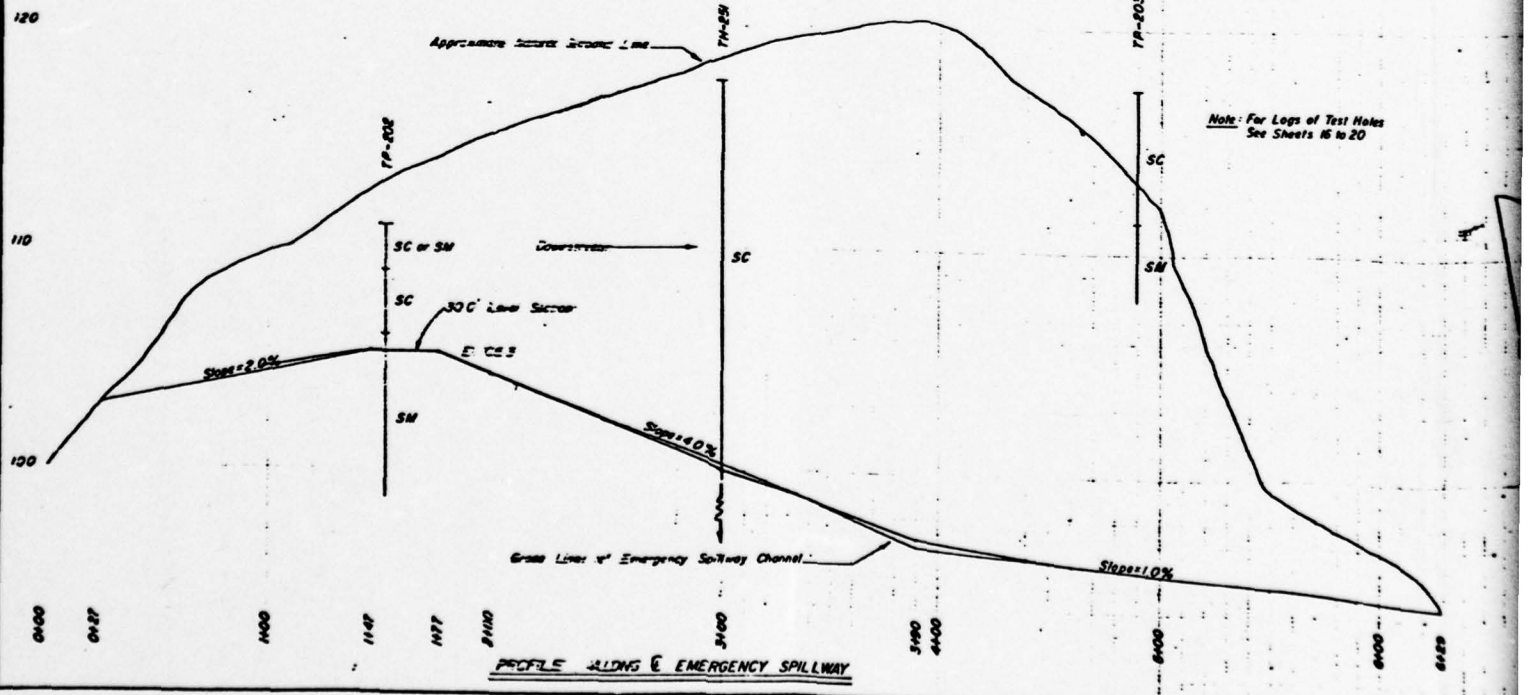
TYPICAL SECTION OF EMBANKMENT



Zone No.	Type USCS
1	CL
1	CL-ML
2 B	SM
2 B	SM
2 B	SM
2 B	SM
2	SM
2	SM
3	ML
3	MH

B To Be Used





EARTH FILL REQUIREMENTS

Zone No	Type USCS	Location	Represented By Borrow Pit	Compaction Requirements	Moisture Limits % of Optimum	Max Rock Size	Maximum Lift Prior To Compaction
1	CL	Borrow Area 1	TP 103 & 106 From 1 to 4	Class A, 95% Max. Dry Density, ASTM D-698 Method A	-1 to +2	6"	9"
1	CL-ML	Borrow Area 1	TP 107 From 1' to 4'	-	-1 to +2	6"	9"
2 B	SM	E. Spillway	TP 207, 202 & 203 From 1 to 6	-	-1 to +2	6"	9"
2 B	SM	Borrow Area 1	TH 151, 152, 153 & 154 From 2' to 15'	-	-1 to +4	6"	9"
2 B	SM	" " "	TP 106 From 8' to 13'	-	-2 to +3	6"	9"
2 B	SM	" " "	TP 107 From 4' to 8'	-	-2 to +3	6"	9"
2	SM	E. Spillway	TP 201, 202 & 203 From 6' to 12'	-	-2 to +3	6"	9"
2	SM	Borrow Area 1	TP 104, 105 & 106 From 2' to 5'	-	-1 to +3	6"	9"
3	ML	Borrow Area 1	TP 104, 105 & 106 From 5' to 10'	-	-2 to +4	6"	9"
3	MH	" " "	TP 105 From 8' to 12'	-	-2 to +5	6"	9"

B To Be Used For Constructing The Center Portion Of Zone 2

El 75.0

3+00 3+50 4+00 4+50 5+00 5+50

ALONG ℄ PRINCIPAL SPILLWAY

Approx. Stripped Ground Line

Pay Limit

Approx. Bottom of Principal Spillway Excavation (Structure Excavation)

Begin Exit Channel Excavation (See Sheets 4 & 6)

Pay Limit

Bottom of Stilling Basin Excavation (Channel Excavation)

Pay Limit

3:1 Slope to Stripped Ground

20'

Typical Section
Principal Spillway
Sta. 1+72 to Sta 4+72

TP-203

Note: For Logs of Test Holes See Sheets 16 to 20

SC

SM

Slope=10%

2:1 Slope to Stripped Ground

110'

Typical Section
Emergency Spillway
Sta 1+30 to Sta 5+45

2:1 Slope to Stripped Ground

110'

Typical Section
Emergency Spillway
Sta 0+27 to Sta. 1+30
& Sta 5+45 to Sta 6+69

AS BUILT

GILBERT RUN WATERSHED
SITE NO. 2
CHARLES COUNTY, MARYLAND
FILL PLACEMENT & SPILLWAY EXCAVATION

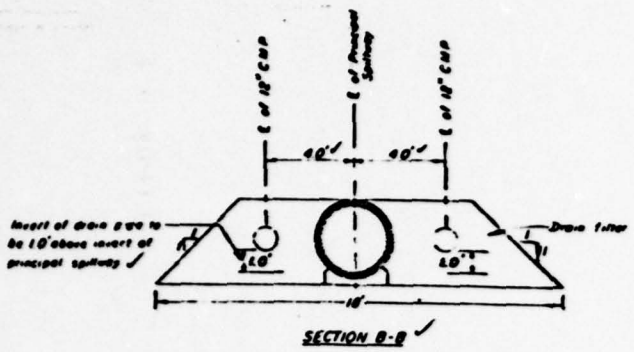
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

		Date	
Designed	J. J. Monk	10/66	Approved by
Drawn	Barbrutter & Monk	10/66	Title
Traced	D. Powell	10/66	Title
Checked	J. C. Cotton	10/66	Sheet No. 6 of 20

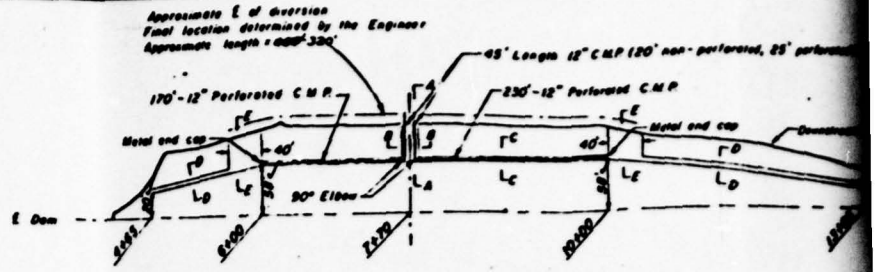
Drawing No. MD. 409-P

PLATE NO. 3

FORM SCS 316 APRIL 1963

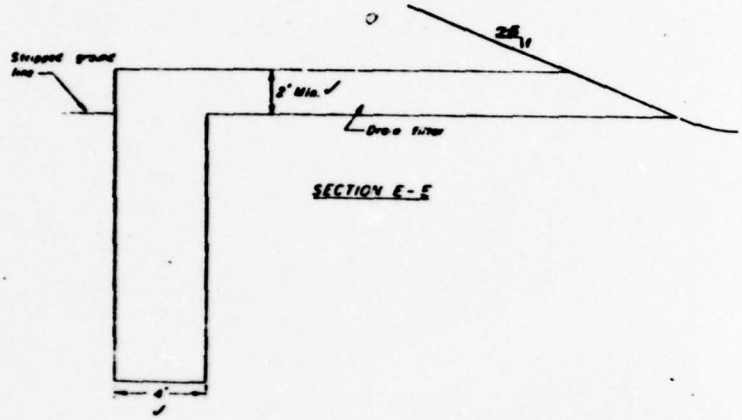


SECTION B-B

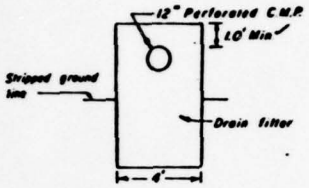


PLAN OF DRAINAGE SYSTEM

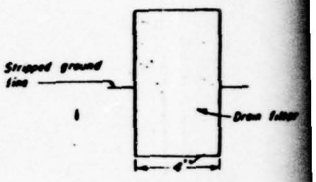
SCALE
100 0 100 200



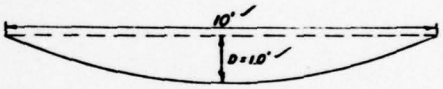
SECTION E-E



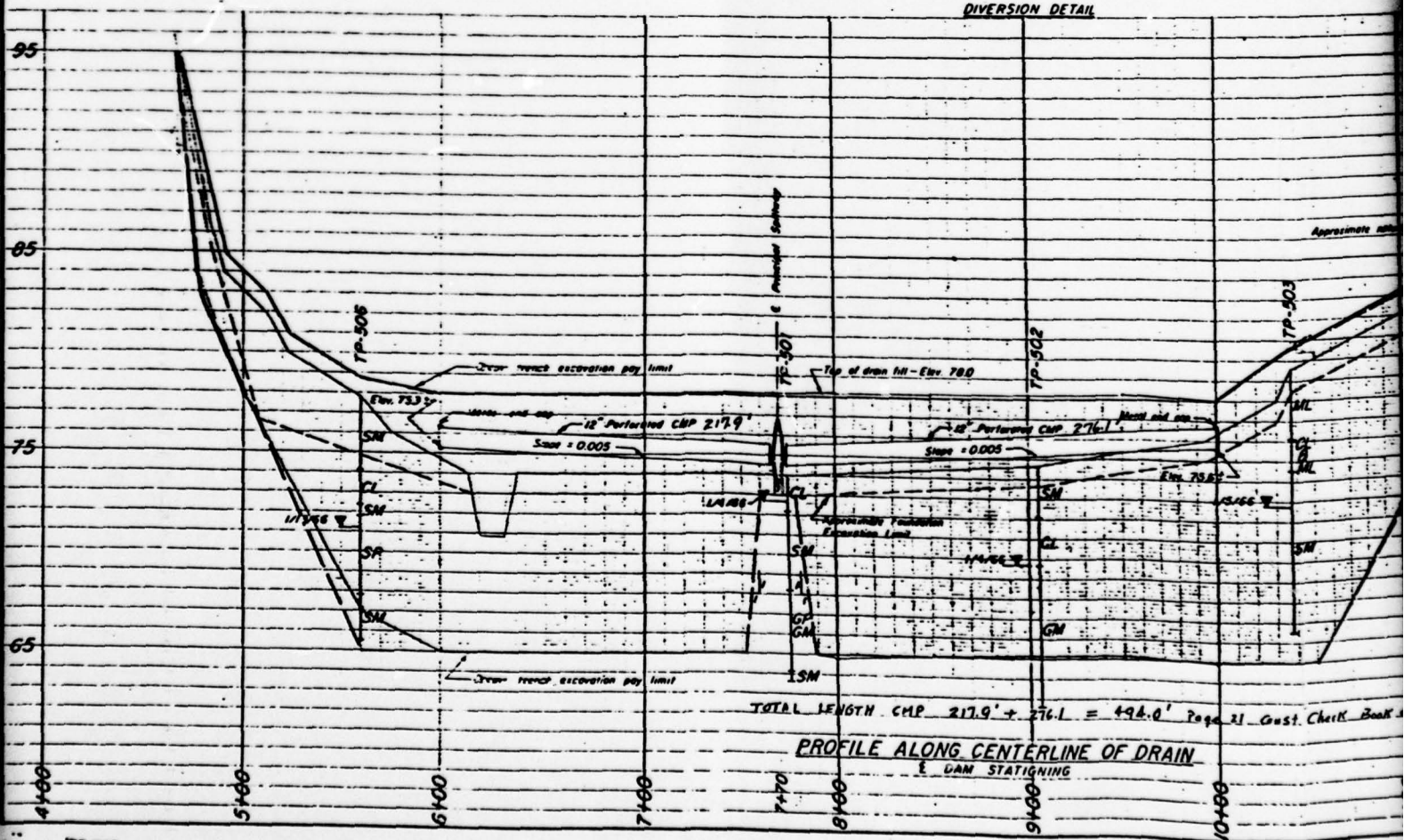
SECTION C-C



SECTION D-D

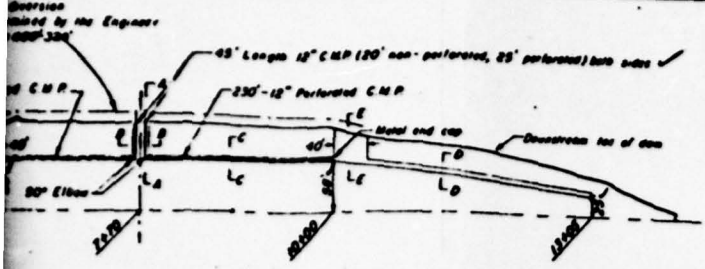


DIVERSION DETAIL

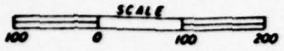


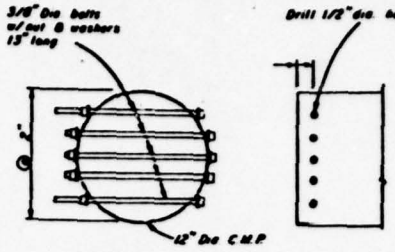
TOTAL LENGTH CMP 217.9' + 276.1' = 494.0' Page 21 Quest Check Book

PROFILE ALONG CENTERLINE OF DRAIN
℄ DAM STATIGNING

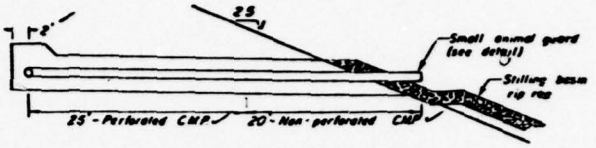


PLAN OF DRAINAGE SYSTEM



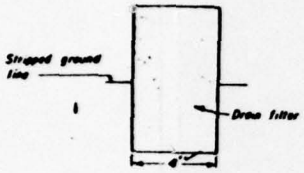


SMALL ANIMAL GUARD DETAILS
(2 REQUIRED)



SECTION A-A

SECTION C-C



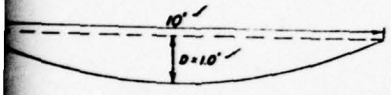
SECTION D-D

CONSTRUCTION DETAILS

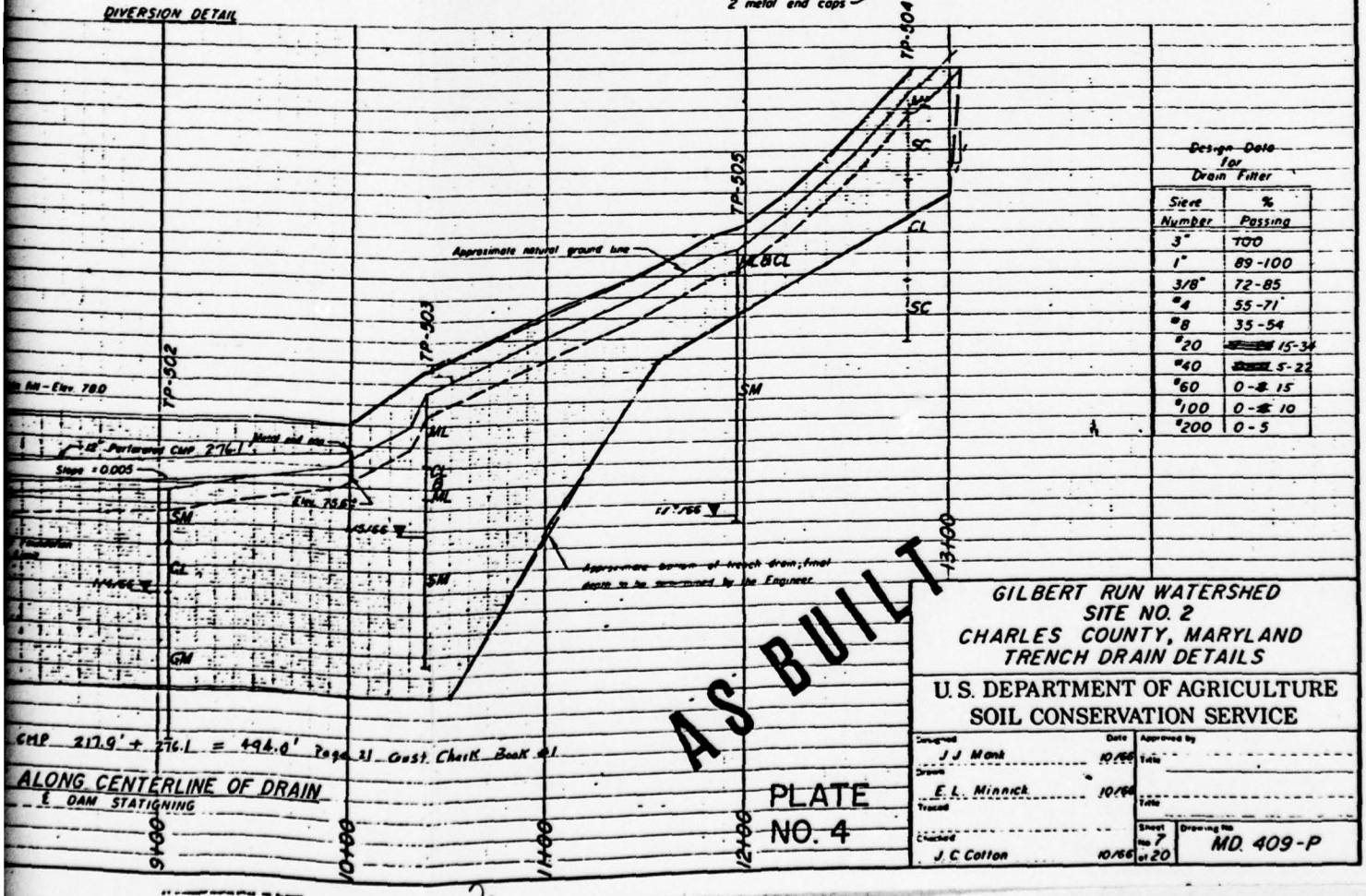
1. Quality of drain fill material shall be in accordance with Specification 105
2. All drain pipe shall conform to the provisions of Specification 110 and shall be 16 gauge, shape 1, class 1, type D.
3. The profiles of the bottom of all excavation as shown are approximate the required final grades will be established by the Engineer.
4. For description of logs see sheets 16 to 20

QUANTITY SUMMARY

1504 cu yds drain fill
450' of 12" dia perf C.M.P.
40' of 12" dia non-perf C.M.P.
2 - 3 piece 90° elbows 12" dia
2 metal end caps



DIVERSION DETAIL



Design Data for Drain Filter

Sieve Number	% Passing
3"	100
1"	89-100
3/8"	72-85
#4	55-71
#8	35-54
#20	15-34
#40	5-22
#60	0-15
#100	0-10
#200	0-5

CMP 217.9' + 276.1 = 494.0' Page 31 Cust. Check Book #1

ALONG CENTERLINE OF DRAIN
℄ DAM STATIGNING

AS BUILT

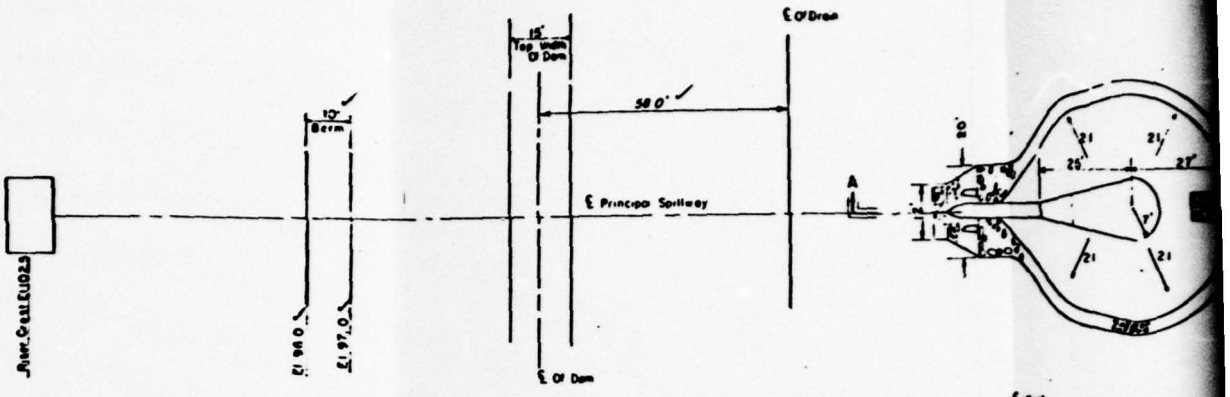
PLATE NO. 4

GILBERT RUN WATERSHED
SITE NO. 2
CHARLES COUNTY, MARYLAND
TRENCH DRAIN DETAILS

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed J.J. Monk	Date 10/66	Approved by	Title
Drawn E.L. Minnick	10/66		Title
Traced		Sheet No. 7 of 20	Drawing No. MD. 409-P
Checked J.C. Colton	10/66		

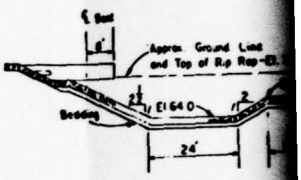
3



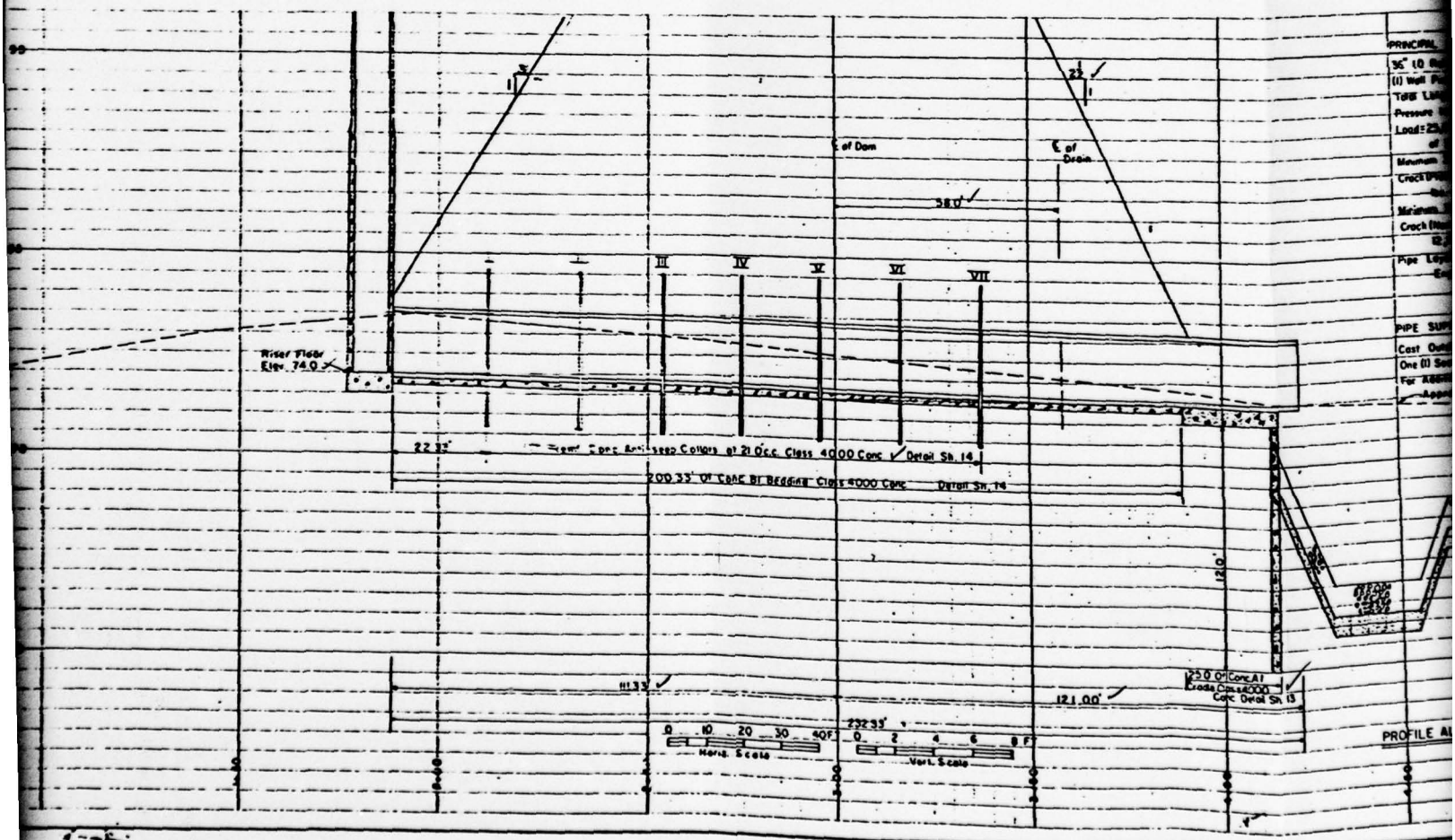
PLAN VIEW

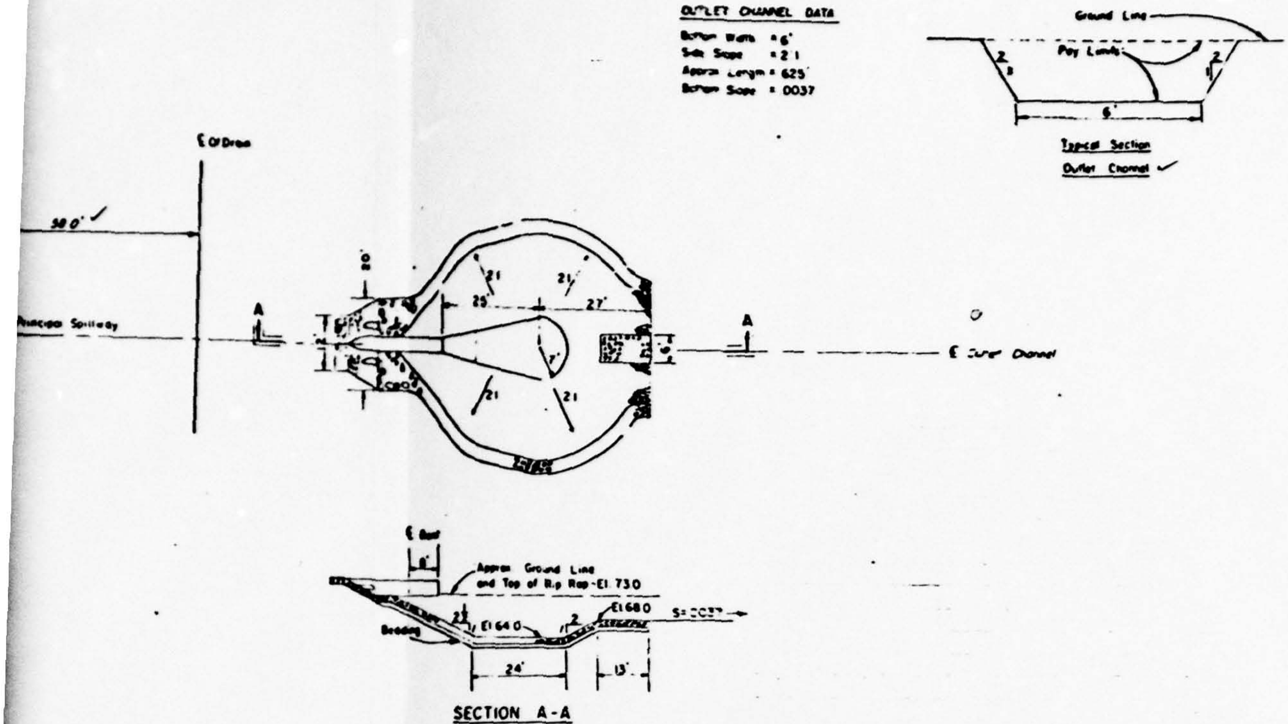
0 10 20 30 40 FT.

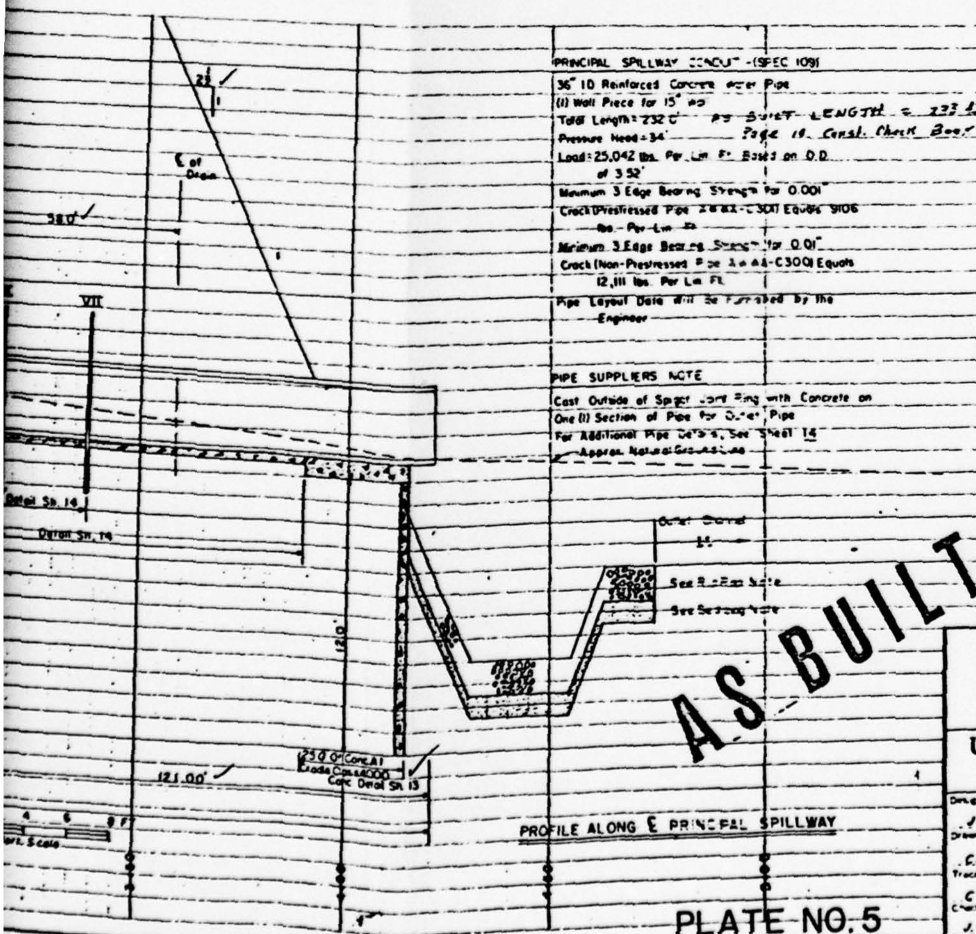
Scale



SECTION A-A







PRINCIPAL SPILLWAY CONDUIT - (SPEC 109)

36" ID Reinforced Concrete Water Pipe
(1) Wall Piece for 15° ...
Total Length = 232.0' — As Built Length = 233.13
Pressure Head = 34' — Page 19, Const. Check Book #1
Load = 25,042 lbs. Per Lin. Ft. Based on O.D. of 3.52'
Minimum 3 Edge Bearing Strength for 0.001" Crack (Prestressed Pipe AWWA-C301) Equals 9106 lbs. Per Lin. Ft.
Minimum 3 Edge Bearing Strength for 0.01" Crack (Non-Prestressed Pipe AWWA-C300) Equals 12,111 lbs. Per Lin. Ft.
Pipe Layout Data Will Be Furnished by the Engineer

PIPE SUPPLIERS NOTE

Cast Outside of Spigot Joint Ring with Concrete on One (1) Section of Pipe for Outlet Pipe
For Additional Pipe Details, See Sheet 14
Approx. Natural Ground Line

Rip Rap Note
Size 12 to 36"
50% ≥ 24"
... Min. Thickness
Equipment Placed

Bedding Note
Min. Thickness - 12"
Gradation Limits
As For Filter Drain

Collar	Distance From Riser Wall	Invert Elev. Of 36" Pipe
I	22.33	73.99
II	43.33	73.97
III	64.33	73.95
IV	85.33	73.91
V	106.33	73.84
VI	127.33	73.75
VII	148.33	73.62

AS BUILT

GILBERT RUN WATERSHED
SITE NO. 2
CHARLES COUNTY, MARYLAND
PRINCIPAL SPILLWAY

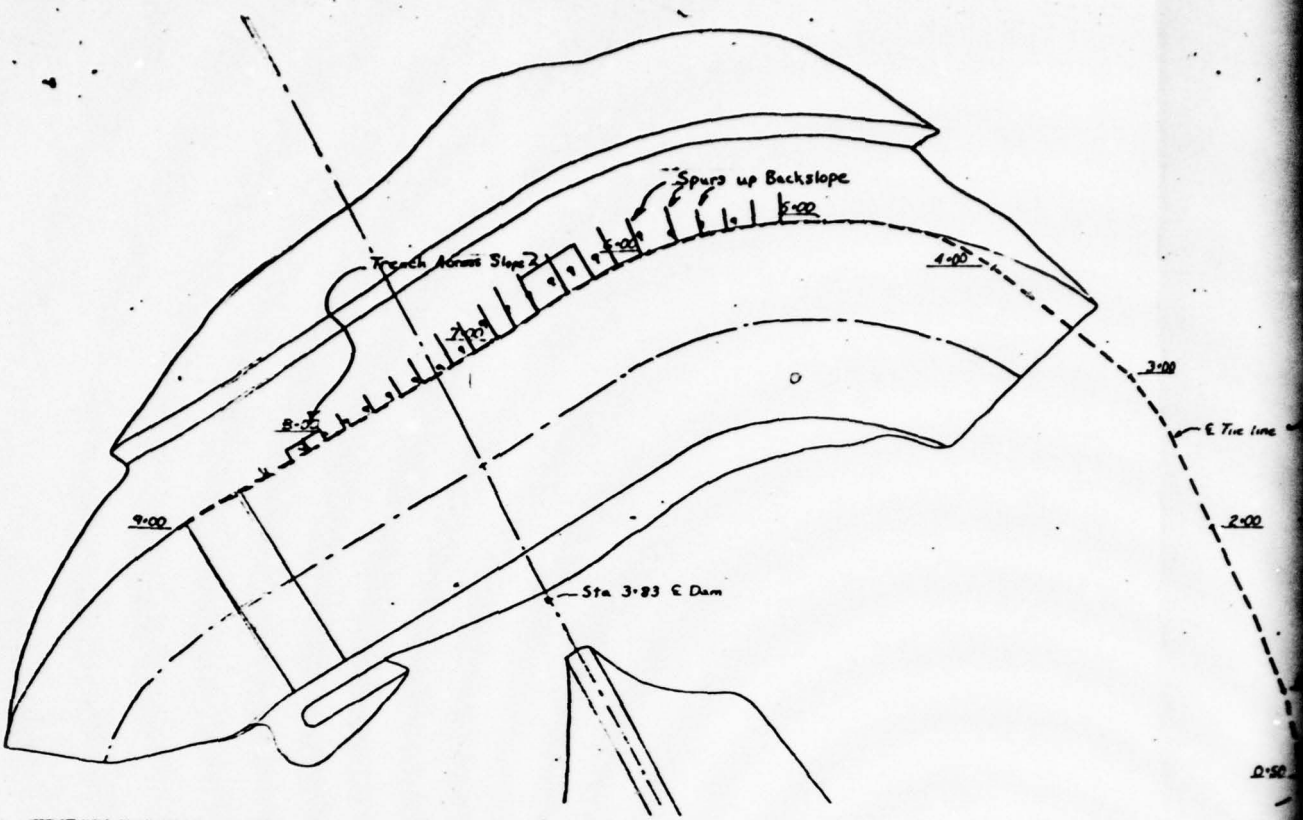
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

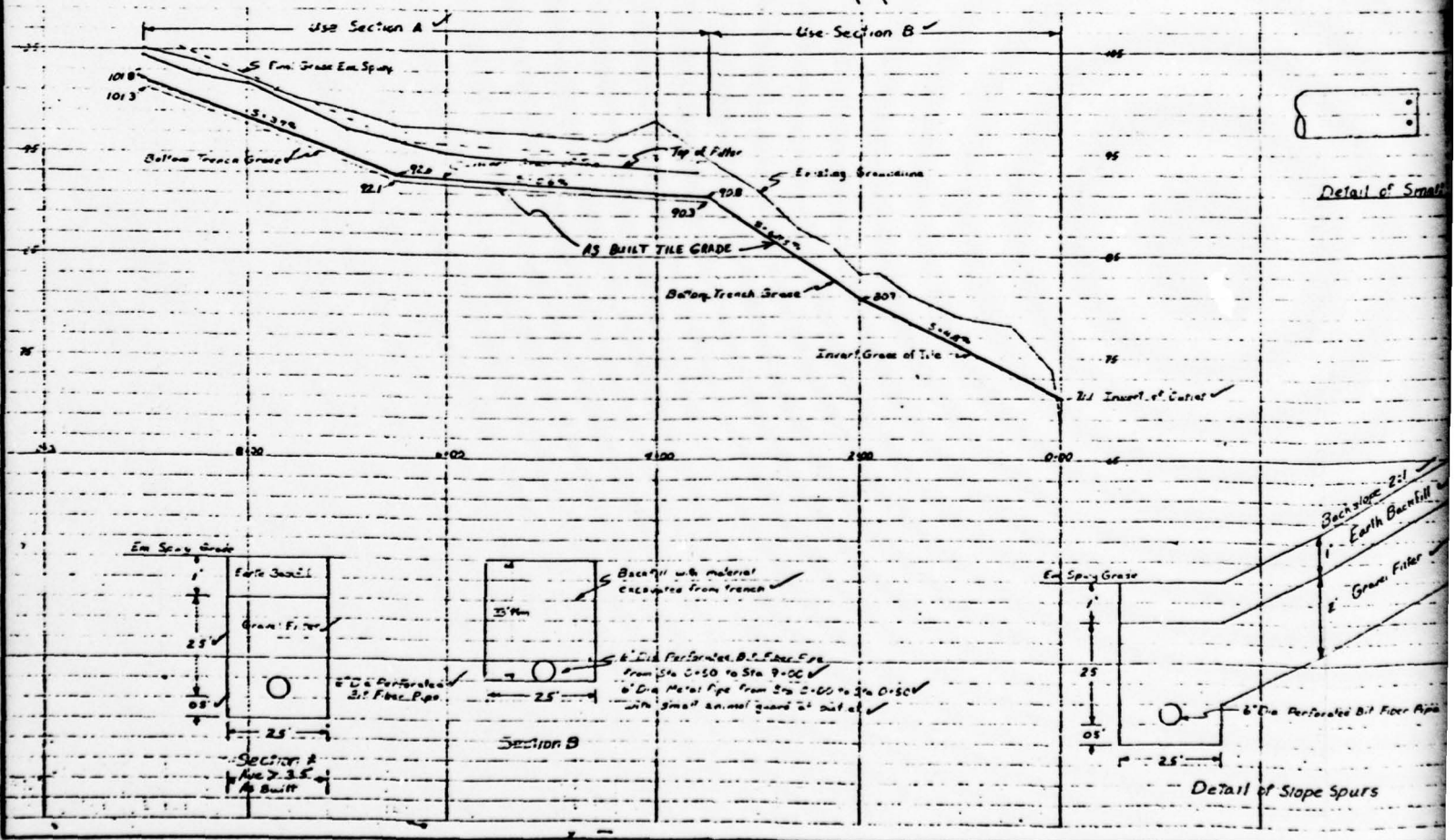
	Name	Date	
Designed	J. J. Wang	10/66	Approved by / Title
Drawn	C. J. MacGowan	10/66	Title
Traced	C. J. MacGowan	10/66	Sheet No. 8 of 20
Checked	J. C. Cotton	10/66	Drawing No. MD 409-P

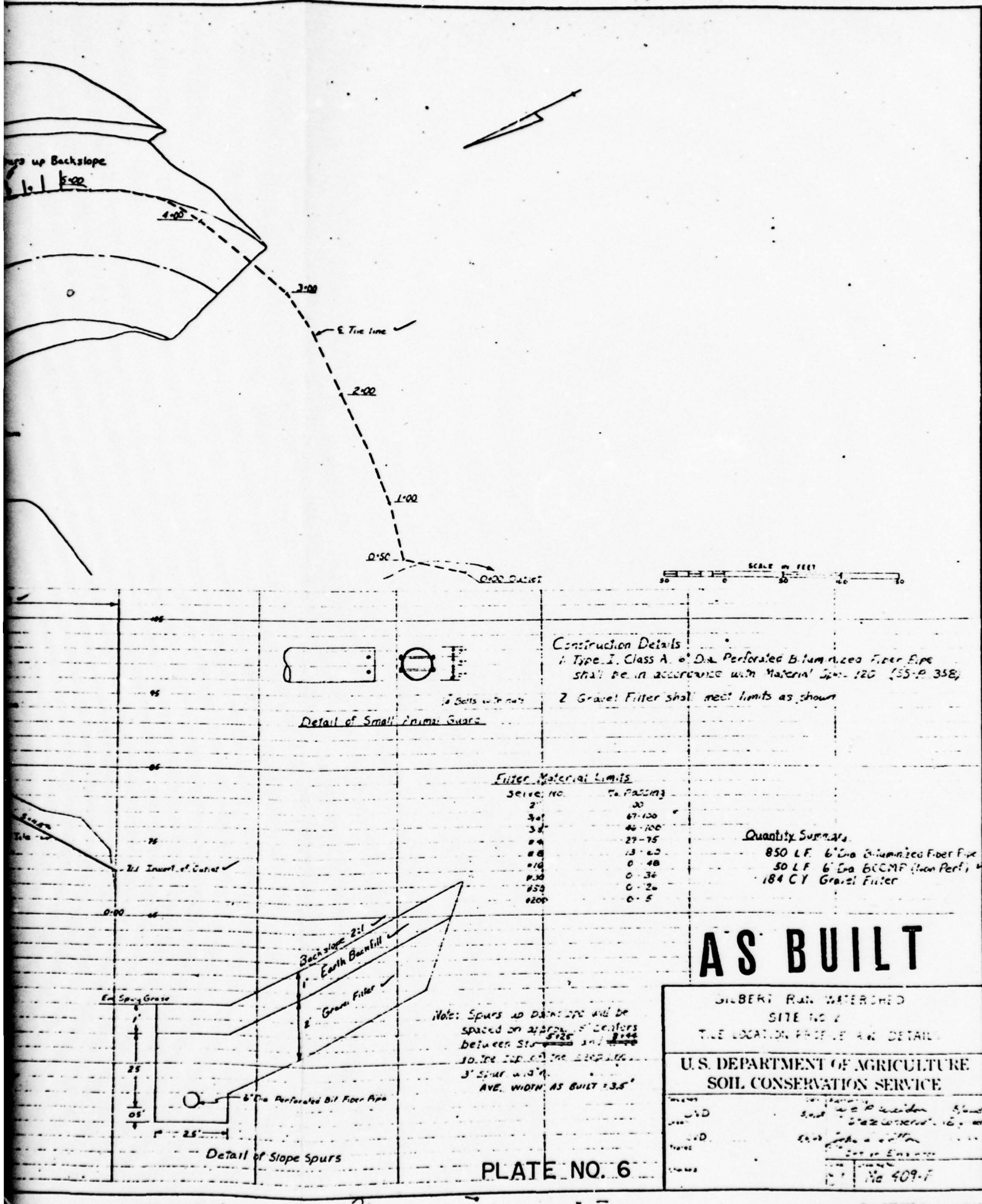
PLATE NO. 5

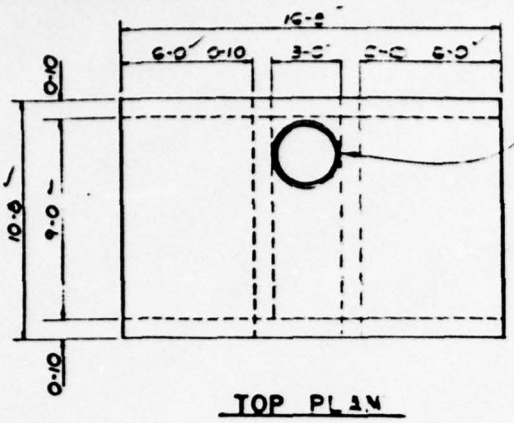
3

21


Spurs up Backslope
Trench Across Slope
5+00
4+00
3+00
E Tile Line
2+00
1+00
0+00
9+00
8+00
Sta 3+83 ℄ Dam


Use Section A
Use Section B
Fin. Grade Em. Spoil
1018
1013
Bottom Trench Grade
Top of Filter
Existing Groundline
AS BUILT TILE GRADE
Bottom Trench Grade
Invert Grade of Tile
Invert of Outlet
Detail of Small
8+30
8+00
7+00
6+00
0+00
Em Spoil Grade
Earth Backfill
Gravel Filter
2.5'
0.5'
2.5'
6" Dia Perforated Bit Fiber Pipe
Backfill with material excavated from trench
3.5' Min
6" Dia Perforated Bit Fiber Pipe from Sta 0+50 to Sta 7+00
6" Dia Metal Pipe from Sta 0+00 to Sta 0+50
with small animal guard at out of
Section A
Section B
Backslope 2:1
1' Earth Backfill
1' Gravel Filter
Detail of Slope Spurs

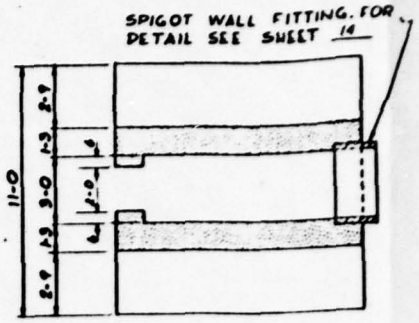

up Backslope
4+00
3+00
℄ Tile line
2+00
1+00
0+50
0+00 Outlet
SCALE IN FEET
Construction Details
1. Type I, Class A, 6" Dia. Perforated Bituminized Fiber Pipe shall be in accordance with Material Spec. 120 (SS-P-358)
2. Gravel Filter shall meet limits as shown
Detail of Small Animal Guard
Filter Material Limits
Seive No. — % Passing
2" — 100
3/4" — 67-100
3/8" — 46-100
#4 — 27-75
#8 — 13-60
#10 — 0-48
#30 — 0-36
#50 — 0-20
#200 — 0-5
Quantity Summary
850 L.F. 6" Dia. Bituminized Fiber Pipe
50 L.F. 6" Dia. BCCMP (Non Perf.)
184 C.Y. Gravel Filter
Invert of Outlet
Backslope 2:1
Earth Backfill
Gravel Filter
Em. Spwy Grade
2.5'
0.5'
6" Dia. Perforated Bit. Fiber Pipe
Note: Spurs to be installed and be spaced on approx. 50' centers between Sta. 5+25 and 8+44 to the top of the backslope. 3' Spur width.
AVE. WIDTH AS BUILT = 3.5'
Detail of Slope Spurs
PLATE NO. 6
AS BUILT
GILBERT RUN WATERSHED
SITE NO. 2
TILE LOCATION, PROFILE AND DETAILS
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
409-F



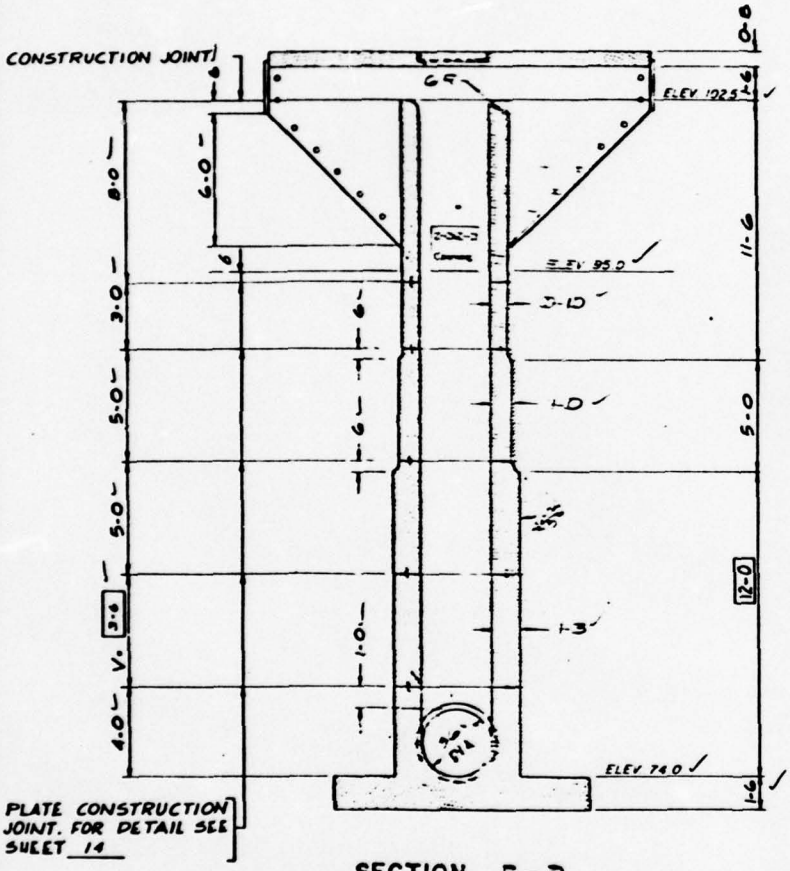
30" Diameter Manhole Assembly Neenah Foundry Co Catalog "R" Model R-6077-A with Type "A" Lift Handle and Type "F" Locking Device or Approved Equal Paint exposed surfaces after installation in accordance with paint system "A"

FOR DETAIL OF TRASH-RACK ANGLES AND GRATING SEE SHEET 13

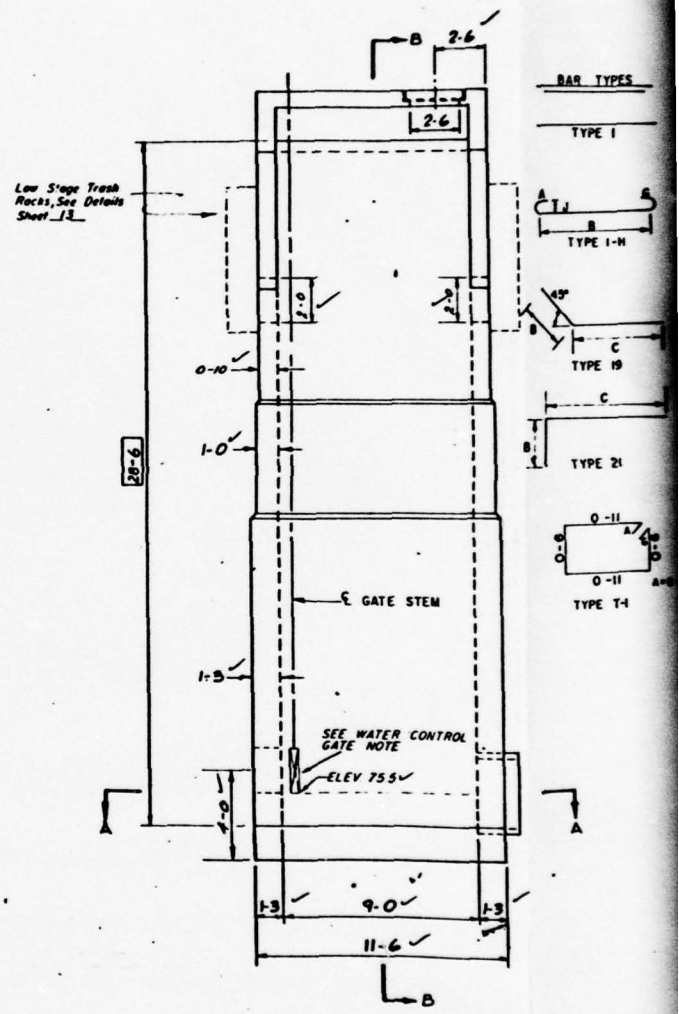
TOP PLAN



SECTION A-A



SECTION B-B



SIDEWALL ELEVATION

C 1 2 3 4 5 6 7 8 9

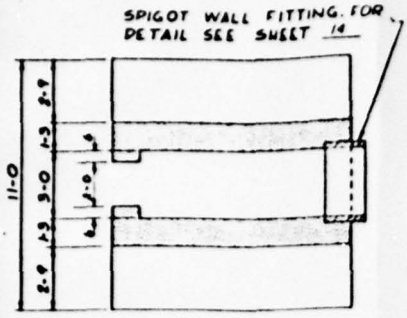
SCALE IN FEET

WATER CONTROL GATE

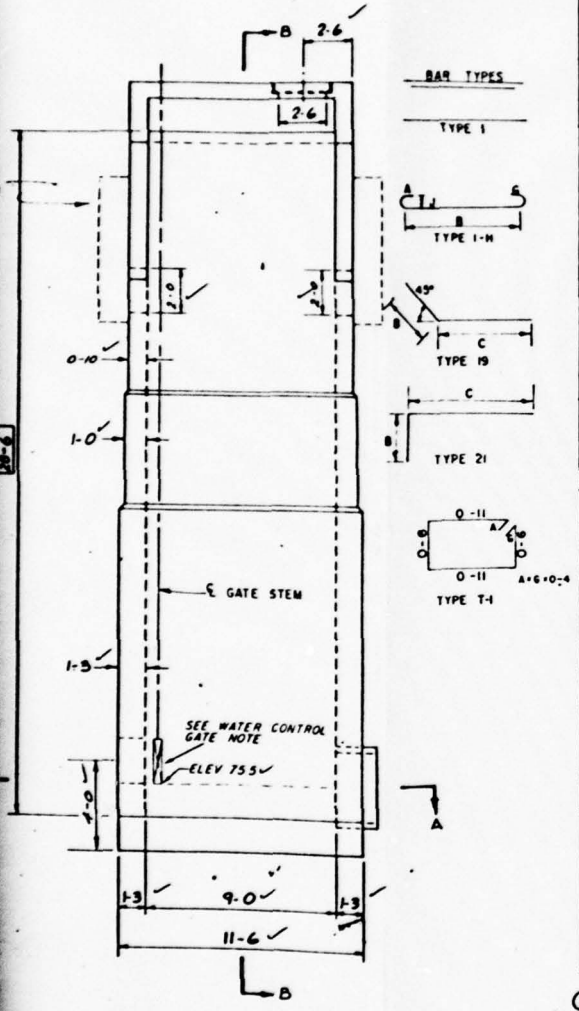
1. 1-24" Dia., Class 0-32 Type MHS-2, Flat Frame, Spec 134
2. F Type wall Thimble, 12" Deep, Round Opening
3. Crank operated lift, pedestal base, as recommended by manufacturer
4. Stem guides, anchor bolts and rising stem, sized and spaced according to manufacturer's recommendations.
5. Channel guides shall be coated with cup grease after the gate has been installed.
6. Paint in accordance with paint system "A"

CONSTRUCTION DETAILS FOR ALL CONCRETE

1. All Concrete Shall Be Class 4000
2. Portland Cement Type IA or Type I with Air-Entraining Admixture Shall Be Used
3. All Reinforcing Steel Placed in Concrete Poured Against the Ground Shall Have A Minimum of 3" Clear Cover. Where Forms are Used Bars Shall Have A Minimum of 2" Clear Cover.
4. All Exposed Edges of Concrete to Have A 3/4" Chamfer Unless Otherwise Specified
5. Class 2 Aggregate Shall Be Size 57, Spec. 101



SECTION A-A



SIDEWALL ELEVATION

Plat Frame, Spec 134
Opening
recommended by
stem, sized and
commendations.
dup grease after
"A"

CONSTRUCTION DETAILS FOR ALL CONCRETE

1. All Concrete Shall Be Class 4000
2. Portland Cement Type IA or Type I with Air-Entraining Admixture Shall Be Used
3. All Reinforcing Steel Placed in Concrete Poured Against the Ground Shall Have A Minimum of 3" Clear Cover. Where Forms are Used Bars Shall Have A Minimum of 2" Clear Cover.
4. All Exposed Edges of Concrete to Have A 3/4" Chamfer Unless Otherwise Specified
5. Class 2 Aggregate Shall Be Size 57, Spec. 101

STEEL SCHEDULE

MARK	SIZE	QUANTITY	LENGTH	TYPE	B	C	TOTAL LENGTH
B1	6	12	10-6	1	-	-	126-0
B2	6	11	11-0	1	-	-	121-0
B3	7	42	11-0	21	3-8	7-4	462-0
B4	6	11	11-0	1	-	-	121-0
B5	6	12	10-6	1	-	-	126-0
B6	6	2	4-9	1	-	-	9-6
B7	5	8	7-6	21	0-11	6-7	60-0
B8	5	5	3-4	21	0-11	2-5	16-8
B9	5	26	7-4	21	0-11	6-5	190-8
B10	6	12	10-0	1	-	-	120-0
B11	5	4	4-0	1	-	-	16-0
B12	7	8	10-6	21	3-9	6-9	84-0
B13	7	6	8-2	21	1-5	6-9	49-0
B14	7	2	7-7	21	0-10	6-9	15-2
B15	7	4	7-5	21	0-8	6-9	29-8
B16	7	2	7-10	21	1-1	6-9	15-8
B17	5	2	3-2	1	-	-	6-4
B18	5	2	2-5	1	-	-	4-10
B19	5	1	2-4	1	-	-	2-4
B20	5	2	2-5	1	-	-	4-10
B21	5	2	2-9	1	-	-	5-6
B22	7	2	8-8	21	1-11	6-9	17-4
R1	5	26	10-1		-	-	263-2
R2	5	8	10-1		-	-	80-8
R3	5	30	8-0		-	-	240-0
R4	5	14	8-0		-	-	112-0
R5	6	10	10-0	1	-	-	100-0
R6	5	10	4-0	1	-	-	40-0
R7	7	24	10-6	21	3-9	6-9	252-0
R8	5	14	9-8	1	-	-	135-4
R9	5	14	3-8	1	-	-	51-4
R10	6	24	10-2	21	3-7	6-7	244-0
R11	6	4	9-8	21	3-4	6-4	38-8
R12	5	30	3-8	1	-	-	110-0
R13	5	14	3-8	1	-	-	51-4
R14	5	20	9-7	1	-	-	193-8
R15	5	6	6-7	1	-	-	39-6
R16	5	22	4-6	1	-	-	99-0
R17	5	10	4-6	1	-	-	45-0
R18	5	14	9-8	1	-	-	135-4
R19	5	10	3-8	1	-	-	36-8
R20	5	28	9-4	21	3-2	6-2	261-4
R21	5	4	9-0	21	3-0	6-0	36-0
R22	5	22	3-8	1	-	-	80-8
R23	5	10	3-8	1	-	-	36-8
R24	5	16	4-7	1	-	-	73-4
R25	5	4	4-7	1	-	-	18-4
R26	5	16	4-7	1	-	-	73-4
R27	5	8	4-7	1	-	-	36-8
R28	5	6	9-8	1	-	-	58-0
R29	5	4	3-8	1	-	-	15-4
R30	5	16	9-0	21	3-0	6-0	144-0

* A+G Dimension = 0-7, 0-5

MARK	SIZE	QUANTITY	LENGTH	TYPE	B	C	TOTAL LENGTH
R31	5	4	3-4	1	-	-	13-4
R32	5	2	3-4	1	-	-	6-8
T1	5	16	7-6	1	-	-	120-0
T2	5	12	9-8	1	-	-	116-0
T3	5	10	7-9	1	-	-	124-0
T4	5	4	9-10	1	-	-	39-4
T5	6	12	9-10	1	-	-	118-0
T6	5	24	9-0	21	3-0	6-0	216-0
T7	5	4	3-8	1	-	-	14-8
T8	5	2	9-8	1	-	-	18-4
T9	5	2	9-2	1	-	-	18-4
T10	5	2	11-8	1	-	-	23-4
T11	6	2	14-2	1	-	-	28-4
T12	5	2	16-3	1	-	-	32-6
T13	5	4	7-8	1	-	-	30-8
T14	5	4	6-5	1	-	-	25-8
T15	5	4	5-2	1	-	-	20-8
T16	5	4	3-11	1	-	-	15-8
T17	5	4	2-8	1	-	-	10-8
T18	5	4	10-7	19	2-2	8-5	42-4
T19	5	4	9-0	21	3-0	6-0	36-0
T20	5	2	6-8	1	-	-	13-4
T21	5	2	9-2	1	-	-	18-4
T22	5	2	11-8	1	-	-	23-4
T23	5	2	14-2	1	-	-	28-4
T24	5	2	16-3	1	-	-	32-6
T25	5	4	7-8	1	-	-	30-8
T26	5	4	6-5	1	-	-	25-8
T27	5	4	5-2	1	-	-	20-8
T28	5	4	3-11	1	-	-	15-8
T29	5	4	2-8	1	-	-	10-8
T30	5	4	10-7	19	2-2	8-5	42-4
T31	5	2	16-3	1	-	-	32-6
T32	5	2	16-3	1	-	-	32-6
T33	4	24	9-8	1	-	-	232-0
T34	4	2	6-2	1	-	-	12-4
T35	4	9	16-3	1	-	-	146-3
T36	4	4	6-7	1	-	-	26-4
T37	5	2	2-8	21	1-10	0-10	5-4
T38	5	28	7-9	21	1-10	5-11	217-0
T39	5	2	8-3	21	1-10	6-5	16-6
T40	4	4	6-7	1	-	-	26-4
T41	4	9	16-3	1	-	-	146-3
T42	5	2	7-1	1	-	-	14-2
T43	5	2	7-1	1	-	-	14-2
T44	5	6	11-4	1-H	10-2	*	68-0
T45	5	8	6-11	21	0-11	6-0	55-4
T46	3	12	5-6	T-1	See Detail		42-0

AS BUILT

QUANTITIES

#3 BARS	42-0	6	LBS
#4 BARS -	589-6	- 394	LBS
#5 BARS -	4492-8	- 1686	LBS
#6 BARS -	1886-2	- 1511	LBS
#7 BARS -	924-10	- 1890	LBS
		8497	LBS

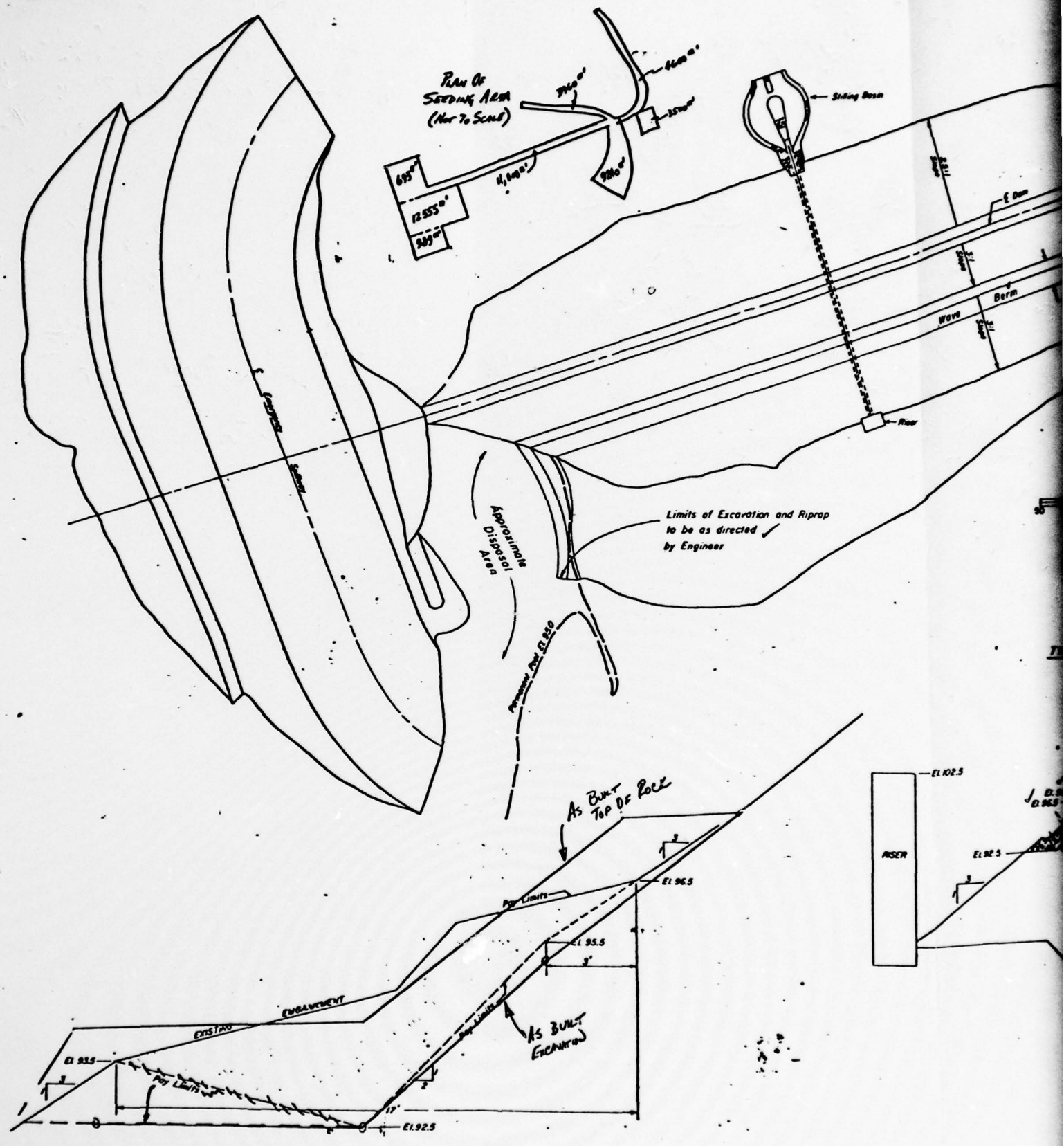
CONCRETE = 45.9 CU. YDS

PLATE NO. 7

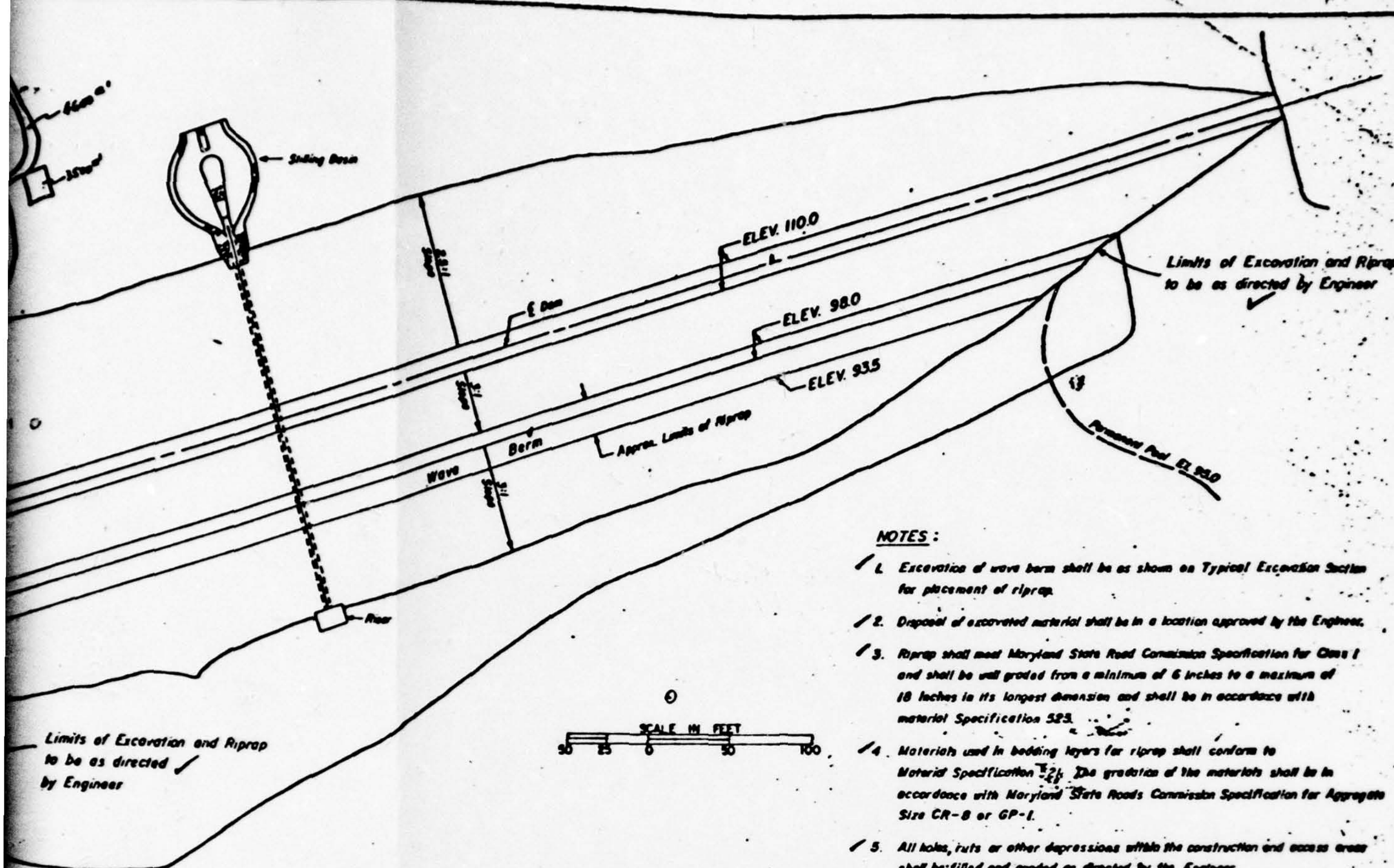
GILBERT RUN WATERSHED
SITE NO. 2
CHARLES COUNTY, MARYLAND
RISER STRUCTURAL DETAILS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed J.J. Monk	Date 10/55	Approved by	
Drawn J.J. Monk	10/55	Title	
Traced D.M. Powell	10/55	Title	
Checked J.C. Cotton	10/55	Sheet No. 9 of 20	Drawing No. MD. 409-P



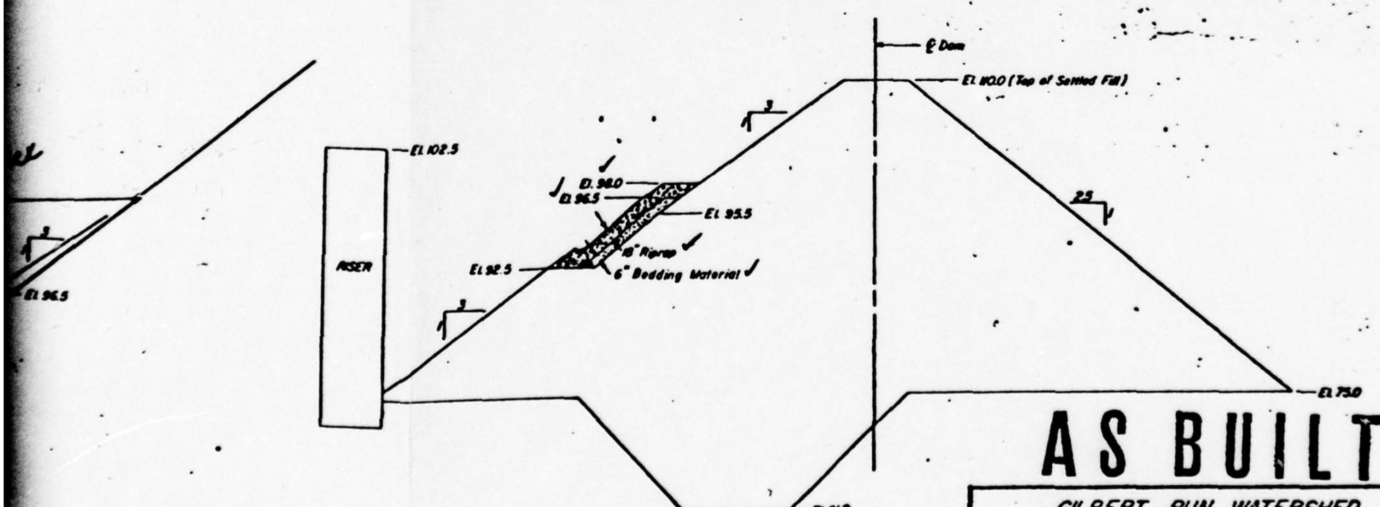
TYPICAL EXCAVATION FOR PLACEMENT OF RIPRAP



NOTES:

1. Excavation of wave berm shall be as shown on Typical Excavation Section for placement of riprap.
2. Disposal of excavated material shall be in a location approved by the Engineer.
3. Riprap shall meet Maryland State Road Commission Specification for Class I and shall be well graded from a minimum of 6 inches to a maximum of 18 inches in its longest dimension and shall be in accordance with material Specification 523.
4. Materials used in bedding layers for riprap shall conform to Material Specification 521. The gradation of the materials shall be in accordance with Maryland State Roads Commission Specification for Aggregate Size CR-8 or GP-1.
5. All holes, ruts or other depressions within the construction and access areas shall be filled and graded as directed by the Engineer.
6. All disturbed areas to be seeded, shall be located by the Engineer and seeded in accordance with Construction Specification 410.

TYPICAL SECTION OF EMBANKMENT



AS BUILT

GILBERT RUN WATERSHED
SITE NO. 2
CHARLES COUNTY, MARYLAND
PROTECTION OF WAVE BERM

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

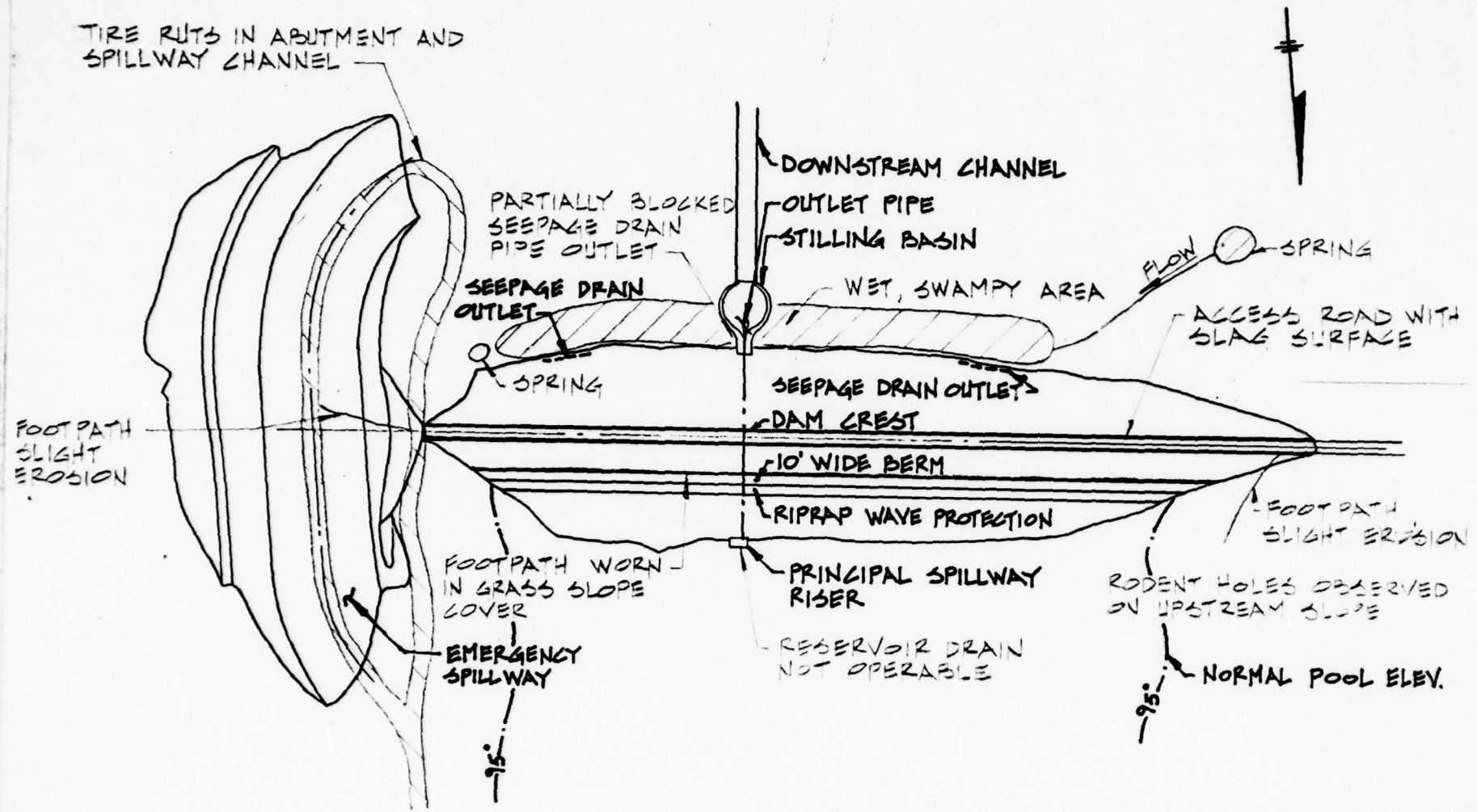
		Date		
Designed	J.C. Cotton	6-71	Approved by	[illegible] 6-19-71
Drawn	J.C. Cotton	6-71	Title	St. Cons. Eng.
Traced	R.A. Bentz	6-71	Title	
Checked			Sheet 1 of 1	Drawing No. MD 409-P

PLATE NO. 8

SCS-313 (9-64)

APPENDIX A

FIELD SKETCH AND VISUAL OBSERVATIONS CHECKLIST



FIELD SKETCH OF WHEATLEY DAM
GILBERT RUN SITE No. 2

A1

CHECK LIST
VISUAL INSPECTION
PHASE 1

Name Dam Gilbert Run Site #2 Wheatley Dam County Charles State Maryland National ID # MD 60

Type of Dam Earthfill Hazard Category Class II-Significant Hazard

Date(s) Inspection 3/22/79 Weather Clear Temperature 70° F

Inspection Review Date 6/6/79

Pool Elevation at Time of Inspection *95 ft. M.S.L. Tailwater at Time of Inspection *69 ft. M.S.L.

*Pool at riser orifice elevation.

*Approximately 4 ft. below R.C. pipe invert.

Inspection Personnel:

ACKENHEIL & ASSOCIATES	WATER RESOURCES ADMINISTRATION	SOIL CONSERVATION SERVICE	CHARLES COUNTY
P. A. D'Amato	T. Moynahan	R. Ensor	W. Ensor, Park Manager
T. E. Debes		D. Lloyd	M. Mud, Co. Park Service
J. D. Hainley		D. Rames	

Recorder P. A. D'Amato

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS*
SURFACE CRACKS	None observed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Both upstream and downstream slopes have mowed, dense grass covering. Worn footpath along length of upstream slope above riprap. Also, slightly eroded footpath from crest down upstream slope at west abutment. No sloughing observed on embankment slopes. Rodent holes observed on upstream slope. Approximately 8 ft. wide strip on downstream slope at west abutment being replanted with grass.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	No noticeable horizontal or vertical misalignment.	
RIPRAP FAILURES	Visible part of riprap slope protection on upstream slope is in good condition.	

*REFER TO REPORT SECTIONS 3 AND 7

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SETTLEMENT	No noticeable settlement.	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Eroded footpath on east abutment from dam crest to bottom of spillway channel. Tire ruts in grass cover on east abutment.	
ANY NOTICEABLE SEEPAGE	Springs were observed at two (2) locations: (1) At downstream toe near east abutment (marked with stake). (2) Approximately 50 ft. downstream of dam in parking lot, spring flow runs across access road to diversion channel.	
STAFF GAGE AND RECORDER	None.	
DRAINS	Flowing water observed from both 12 in. dia. seepage drain pipe outlets. Outlets are partially blocked by algae growth with brown (iron) staining. Drains do not extend out past riprap. Need repair.	

OUTLET WORKS

(Pond Drain)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Reinforced concrete pipe conduit is in good condition. No cracking or spalling of concrete was noted. Tailwater level approximately 4 ft. below invert of pipe outlet. (Patching on concrete pipe support) Joint filled with bituminous material with crack. Shows movement.	
INTAKE STRUCTURE	Reinforced concrete intake riser is in good condition. No cracking or spalling of concrete observed. Trash racks were free of debris and in good condition. Reservoir drain not operable.	
OUTLET STRUCTURE	None.	
OUTLET CHANNEL	Stilling basin is lined with riprap. Depth and width of stilling basin approximate that shown on design drawings. Side slopes of basin observed to be stable and generally free of flow obstructions.	
EMERGENCY GATE	None.	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	None.	
APPROACH CHANNEL	Tire ruts in grass cover of spillway. Channel is generally densely covered with grass. Small trees and brush growing on sides of channel in some areas.	
DISCHARGE CHANNEL	Same condition as "Approach Channel". Area downstream of discharge channel is heavily wooded.	
BRIDGE AND PIERS	None.	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	N/A	
APPROACH CHANNEL	N/A	
DISCHARGE CHANNEL	N/A	
BRIDGE AND PIERS	N/A	
GATES AND OPERATION EQUIPMENT	N/A	

INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	Two (2) concrete monuments at west abutment in line with centerline of dam crest. No survey made.	
OBSERVATION WELLS	None.	
WEIRS	None.	
PIEZOMETERS	None.	
OTHER	N/A	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Reservoir slopes have gentle to moderate inclinations and are well covered with trees and vegetation. No evidence of landslides or shore erosion.	
SEDIMENTATION	Reservoir water and outlet pipe discharge clear. No significant degree of sedimentation evident.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	The downstream channel is approximately 10 - 12 ft. wide with sides lined with grass and thick brush cover. No apparent obstructions, capable of affecting spillway discharge, were evident.	
SLOPES	No apparent evidence of slope instability.	
APPROXIMATE NO. OF HOMES AND POPULATION	One (1) residence 1,000 ft. from east abutment at elevation approximately 80 ft. above flood plain. Approximately seven (7) inhabited structures located adjacent to and within 2,000 ft. of Gilbert Run, all above estimated flood plain.	

APPENDIX B

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE 1

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE 1

NAME OF DAM Gilbert Run Site #2 Wheatley Dam

ID # MD 60

ITEM	REMARKS
AS-BUILT DRAWINGS	As-built design drawings were provided by the Soil Conservation Service, see Plates 1 through 8. (Plates do not include complete set of design drawings.)
REGIONAL VICINITY MAP	See Appendix E, U.S.G.S. 7.5 min. quadrangle map showing dam site location.
CONSTRUCTION HISTORY	Design plans and drawings were prepared by the Soil Conservation Service in October 1966. Construction of the dam began in August 1967 and was completed in October 1968.
TYPICAL SECTIONS OF DAM	See Plate Nos. 3, 5, and 8.
OUTLETS - PLAN DETAILS CONSTRAINTS DISCHARGE RATINGS	See Plate Nos. 1, 5, and 7 for details of outlet works. Discharge ratings contained in "Hydraulic Design" section of design report.
RAINFALL/RESERVOIR RECORDS	None

ITEM	REMARKS
DESIGN REPORTS	Gilbert Run Watershed, Wheatley Site. Prepared by Soil Conservation Service, October 1966. Specifications and drawing for wave berm protection prepared by Soil Conservation Service dated August 24, 1971.
GEOLOGY REPORTS	Geology report prepared by Soil Conservation Service geologist. Included in design report.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Design report includes: 1. Hydrology computation summaries 2. Flood hydrographs 3. Discharge rating calculations 4. Flood routing 5. Static slope stability analysis
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	See Plate Nos. 2 and 4 for subsurface profiles. Test boring and test pit logs contained in design drawings. Laboratory tests contained in design report include classification, field in-place density tests and sieve analysis contained in Engineer's Report and Test Results, Gilbert Run, Wheatley, Site No. 2.
POST-CONSTRUCTION SURVEYS OF DAM	None reported.
BORROW SOURCES	Borrow materials obtained on-site. Location shown on design drawings.

ITEM	REMARKS
MONITORING SYSTEMS	None.
MODIFICATIONS	Riprap wave protection installed at normal pool level on upstream slope in 1971. Interceptor tile drain installed on east slope of emergency spillway. Increased length of 12 in. dia. perforated CMP in seepage drain.
HIGH POOL RECORDS	None recorded.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Riprap wave protection on upstream embankment slope. Specifications and drawing prepared by Soil Conservation Service, dated August 24, 1971.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None reported.
MAINTENANCE OPERATION RECORDS	Annual maintenance and inspection reports available from Soil Conservation Service District Office in La Plata, Maryland.

ITEM	REMARKS
SPILLWAY PLAN	
SECTIONS	See Plate No. 1 for plan view.
DETAILS	See Plate Nos. 3 and 6 for cross section and details.
OPERATING EQUIPMENT PLANS & DETAILS	See Plate No. 7.
SPECIFICATIONS	Construction and material specifications included in design report prepared by Soil Conservation Service.
MISCELLANEOUS	Other documents include: Construction permit, Charles County Park and Recreation Board, January 1967.

APPENDIX C

HYDROLOGIC AND HYDRUALIC ENGINEERING DATA AND CALCULATIONS

HYDROLOGIC AND HYDRAULIC ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Approximately 50% woodland and 50% pasture and cultivated land.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 95.0 ft. (579 ac.-ft.)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 110.0 ft. (1,850 ac.-ft.)

ELEVATION MAXIMUM DESIGN POOL: 107.4 ft.

ELEVATION TOP DAM: 110.0 ft.

EMERGENCY SPILLWAY

a. Elevation 105.3 ft.
b. Type Trapezoidal open earth channel, vegetated
c. Width 110 ft.
d. Length 500 ft., curved
e. Location Spillover left abutment
f. Number and Type of Gates None

OUTLET WORKS

a. Type Reinforced concrete intake structure with 36 in. dia. R.C. outlet pipe
b. Location 400 ft. west of left abutment and emergency spillway
c. Entrance Inverts 95 ft. - low stage, 102.5 ft. - high stage
d. Exit Inverts 73.0 ft.
e. Emergency Drawdown Facilities None.

HYDROMETEOROLOGICAL GAGES

a. Type None
b. Location None
c. Records None

MAXIMUM NON-DAMAGING DISCHARGE Unknown.

BY PAD
DATE 6/6/79
CHECKED
DATE

ACKENHEIL & ASSOCIATES
CONSULTING ENGINEERS
BALTIMORE, MARYLAND

PROJECT NO

SUBJECT Wheatley Dam - Evaluate overtopping with PMF storm.

SHEET NO C-2 OF

Use SCS triangular unit hydrograph method.

Info from design Report

$\overline{CN} = 77$

$T_c = 2.24$ hrs.

PMF rainfall = 22.4 in./6 hr.

$S = \frac{1000}{CN} - 10 = 3.10$ $\qquad Q = \frac{(P-.2S)^2}{P+0.8S} = \frac{(P-.6)^2}{P+2.4}$

Time Ending	Cum. % of PMF	Cum. Rainfall (in.)	Inc. Rainfall (in.)	Cum. Q (in.)	Inc. Q (in.)	Inc. loss
0.0	0	0	0	0	0	0
0.5	3.5	.78	0.78	0	0	.78
1.0	8.0	1.79	1.01	.34	.34	.67
1.5	14.5	3.25	1.46	1.24	.90	.56
2.0	23.0	5.15	1.90	2.74	1.50	.40
2.5	60.0	13.44	8.29	10.41	7.67	.62
3.0	70.0	15.68	2.24	12.58	2.17	.07
3.5	78.0	17.47	1.79	14.32	1.74 1.73	.05 (.06) *
4.0	84.5	18.93	1.46	15.75	1.43 1.40	.03 (.06) *
4.5	88.5	19.82	.89	16.63	.88 .83	.01 (.06) *
5.0	92.5	20.72	.90	17.51	.88 .84	.02 (.06) *
5.5	96.5	21.62	.90	18.39	.88 .84	.02 (.06) *
6.0	100	22.40	.78	19.16	.77 .72	.01 (.06) *
					18.94	

* Min. retention rate = 0.12"/hr. applied

Unit hydrograph Calc.

$T_p = \frac{\text{Time Int.}}{2} + 0.6\, T_c$

$= \frac{0.5}{2} + 0.6(2.24) = 1.6$ hrs.

Peak Runoff = $\frac{484\, AQ}{T_p}$ $\qquad A = 2.68\ mi^2$
$T_p = 1.6$ hrs.

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DATE 6/6/79
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BALTIMORE, MARYLAND

PROJECT NO

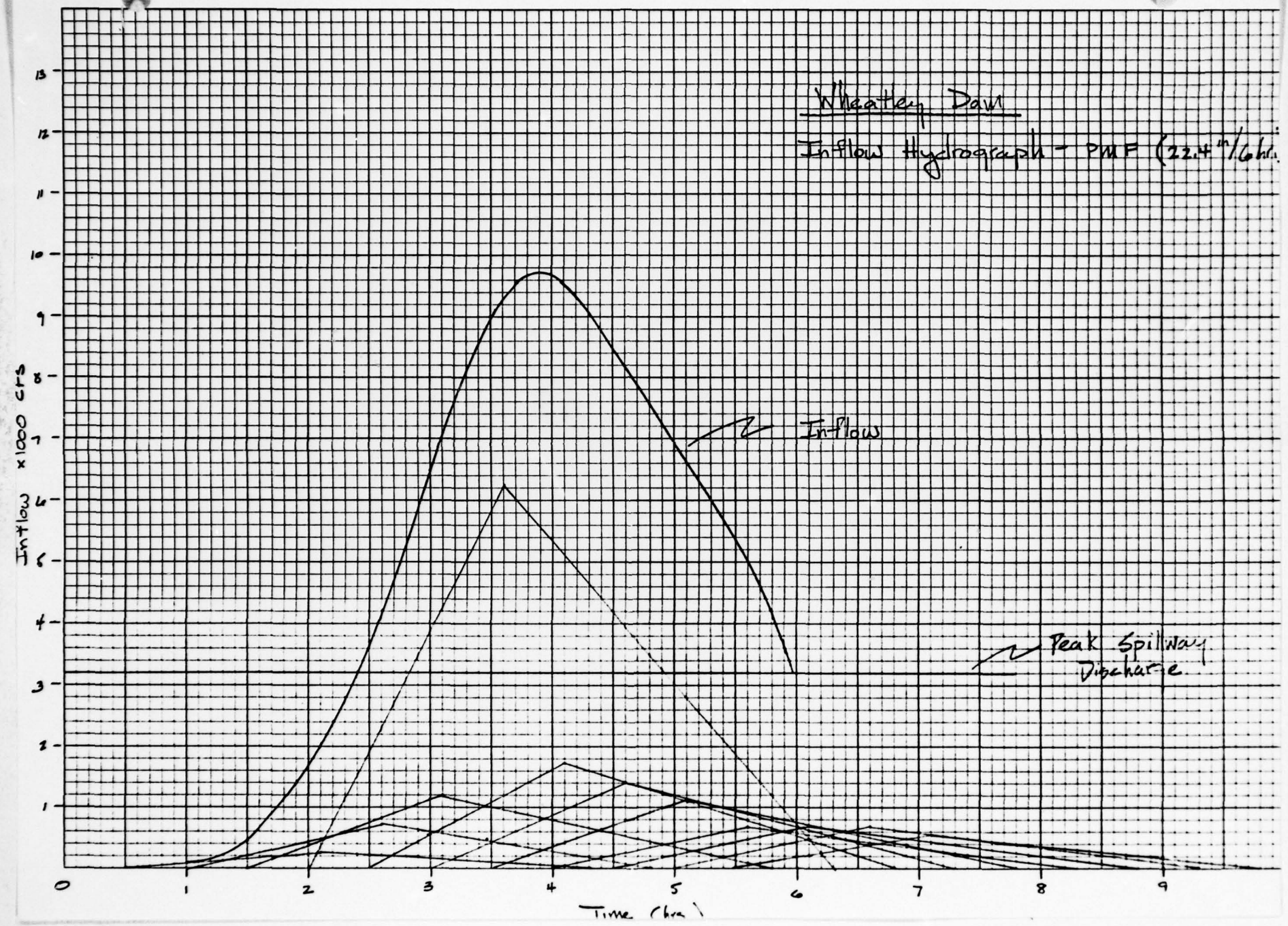
SUBJECT Wheatley Dam - Evaluate Overtopping with PMF storm.

SHEET NO. C-3 OF

Q runoff in.	Start Time - hrs.	Tp (hrs.)	Cum Tp hrs.	Peak R.O. cfs	End Time = 2.67 Tp + Tstart
0	0.0	1.6	1.6	0	4.3
.34	0.5	↓	2.1	276	4.8
.90	1.0		2.6	730	5.3
1.50	1.5		3.1	1216	5.8
7.67	2.0		3.6	6218	6.3
2.17	2.5		4.1	1759	6.8
1.73	3.0		4.6	1403	7.3
1.40	3.5		5.1	1135	7.8
.83	4.0		5.6	673	8.3
.84	4.5		6.1	681	8.8
.84	5.0		6.6	681	9.3
.72	5.5		7.1	584	9.8

Inc. Inflow - from hydrograph plot. - pg C-4

Time	Inc. Inflow - ft^3	Inc. Inflow - Acre-ft.
.5 - 1	0	0
1 - 1.5	495,000	11
1.5 - 2	1,485,000	34
2 - 2.5	4,410,000	101
2.5 - 3	9,180,000	211
3 - 3.5	13,950,000	320
3.5 - 4	16,830,000	386
4 - 4.5	16,380,000	376
4.5 - 5	13,770,000	316
5 - 5.5	10,935,000	251
5.5 - 6	7,695,000	177
	total	2185 acre-ft.


Wheatley Dam
Inflow Hydrograph - PMF (22.4"/6hr.)
Inflow
Peak Spillway Discharge
Inflow x1000 cfs
Time (hrs.)
0
1
2
3
4
5
6
7
8
9
1
2
3
4
5
6
7
8
9
10
11
12
13

BY PAD
DATE 6/6/79
CHECKED
DATE

ACKENHEIL & ASSOCIATES
CONSULTING ENGINEERS
BALTIMORE, MARYLAND

PROJECT NO.

SUBJECT: Wheatley Dam - Evaluate Overtopping with PMF storm.

SHEET NO. C-5 OF

Flood Routing

Stage Storage Curve and Discharge rating curve obtained from design documents.

Time Int.	Inflow - AF	Outflow - AF	Storage* - AF	Reservoir Elev.
0-.5	0	0	0	95
.5-1	2	0	0	95
1-1.5	11	0.1	10.9	95.2
1.5-2	34	0.5	44.4	96
2-2.5	101	1.5	143.9	97.5
2.5-3	211	2.7	352.2	100.2
3-3.5	320	5	667.2	104
3.5-4	386	27	1026	107.8
4-4.5	376	90	1312	110 * crest elev.
4.5-5	316		↓	
5-5.5	251		Dam would overtop	
5.5-6	177			

* storage above normal pool level

Solve by trial & Error

Time 0-.5 Inflow = 0 Outflow = 0 elev. = 95

.5-1.0 Inflow = 0 outflow = 0 elev. = 95

1.0 - 1.5 Inflow = 11 AF
Try elev 95.2 outflow = 4 cfs. avg. = 2 cfs vol = 0.1 AF

S = 11 - .1 = 10.9 elev. = 95.2

BY PAD
DATE 6/6/79

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PROJECT NO

SUBJECT Wheatley Dam - Evaluate overtopping with PMF storm.

SHEET NO. C-6 OF

1.5-2 Inflow = 34
Try elev. 96 outflow = 20 avg. = $\frac{20+4}{2}$ = 12 vol. = .5 AF

S = 34 - .5 + 10.9 = 44.4 elev. = 96 OK.

2-2.5 Inflow = 101
Try elev. 97.5 outflow = 50 avg = $\frac{20+50}{2}$ = 35 vol. = 1.5 AF

S = 101 - 1.5 + 44.4 = 143.9 elev 97.5 OK

2.5-3 Inflow = 211
Try elev. 100.2 outflow = 80 avg. = $\frac{50+80}{2}$ = 65 vol = 2.7 AF

S = 211 - 2.7 + 143.9 = 352.2 elev = 100.2 OK.

3-3.5 Inflow = 320
Try elev. 104 outflow = 160 avg. = $\frac{80+160}{2}$ = 120 vol. = 5 AF

S = 320 - 5 + 352.2 = 667.2 elev. = 104 OK

3.5-4 Inflow = 386
Try. elev. 107.8 outflow = 1160 avg. = $\frac{160+1160}{2}$ = 660 vol. = 27 AF

S = 386 - 27 + 667.2 = 1026 AF elev. = 107.8 OK.

4-4.5 Inflow = 376
Try. elev. 110 outflow = 3200 avg. = $\frac{1160+3200}{2}$ = 2180 vol = 90 AF

S = 376 - 90 + 1026 = 1312 elev = 110.2 OK

4.5-5 Inflow = 316
max outflow = 3200 vol. = 130 AF
inflow exceeds outflow dam would overtop

Est. % PMF runoff dam could pass without overtopping.

Total runoff vol = $\frac{18.94 \text{ in} \times 2.68 \text{ mi}^2 \times 640 \text{ acre/mi}^2}{12 \text{ in/ft}}$ = 2707 AF

runoff during 4.5-6 hr. int. = 744 AF

est. % PMF = $\frac{2707 - 744}{2707}$ = 72 %

Estimate dam can pass 70-80 % PMF without overtopping

BY PAD
DATE 6/20/79
CHECKED
DATE

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CONSULTING ENGINEERS
BALTIMORE, MARYLAND

PROJECT NO

SUBJECT Wheatley Dam - Hydrology

SHEET NO. C-7 OF

1. Determine Rainfall Amount for PMF Design Storm.

PMF rainfall for Charles Co., Maryland = 28 in./6 hr.

obtained from "Design of Small Dams" - pg 48
by. U.S. Dept. of Interior

Data based on Hydrometeorological Report #33
Nat. Weather Service

Watershed area = 2.7 mi²

Use adjustment factor = 0.8

adjusted PMF rainfall = 28 × 0.8 = 22.4 in./6 hr.

½ PMF = ½ × 22.4 = 11.2 in./6 hr.

APPENDIX D

PHOTOGRAPHS

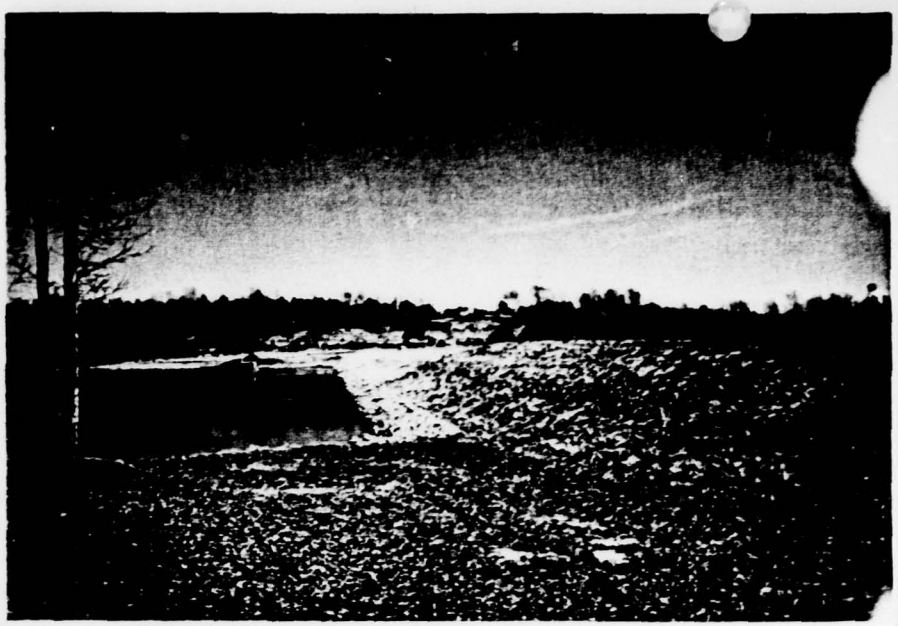
PHOTOGRAPH 1 Crest of dam looking east.

PHOTOGRAPH 2 Upstream embankment slope looking east.

PHOTOGRAPH 3 Principal spillway intake structure.

PHOTOGRAPH 4 Emergency spillway channel looking upstream.

1



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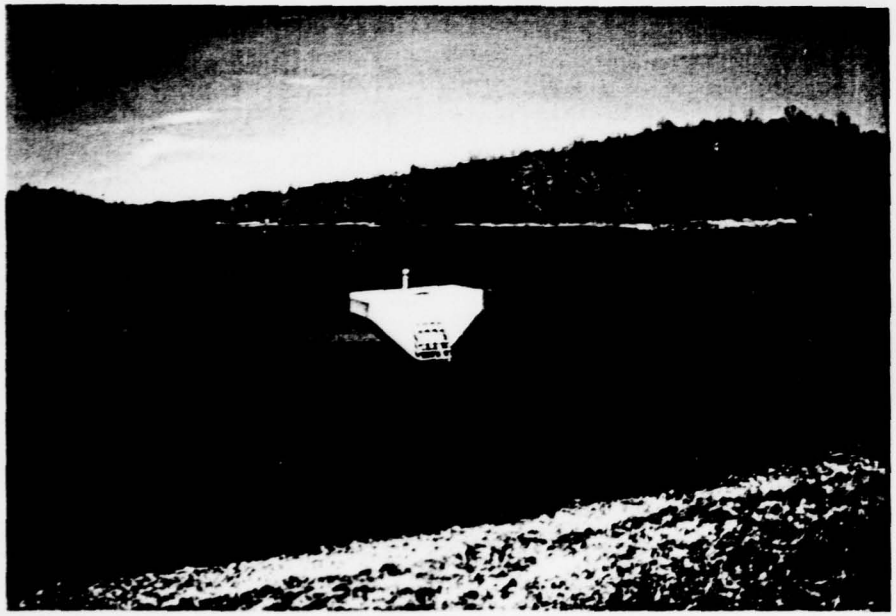

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4

5

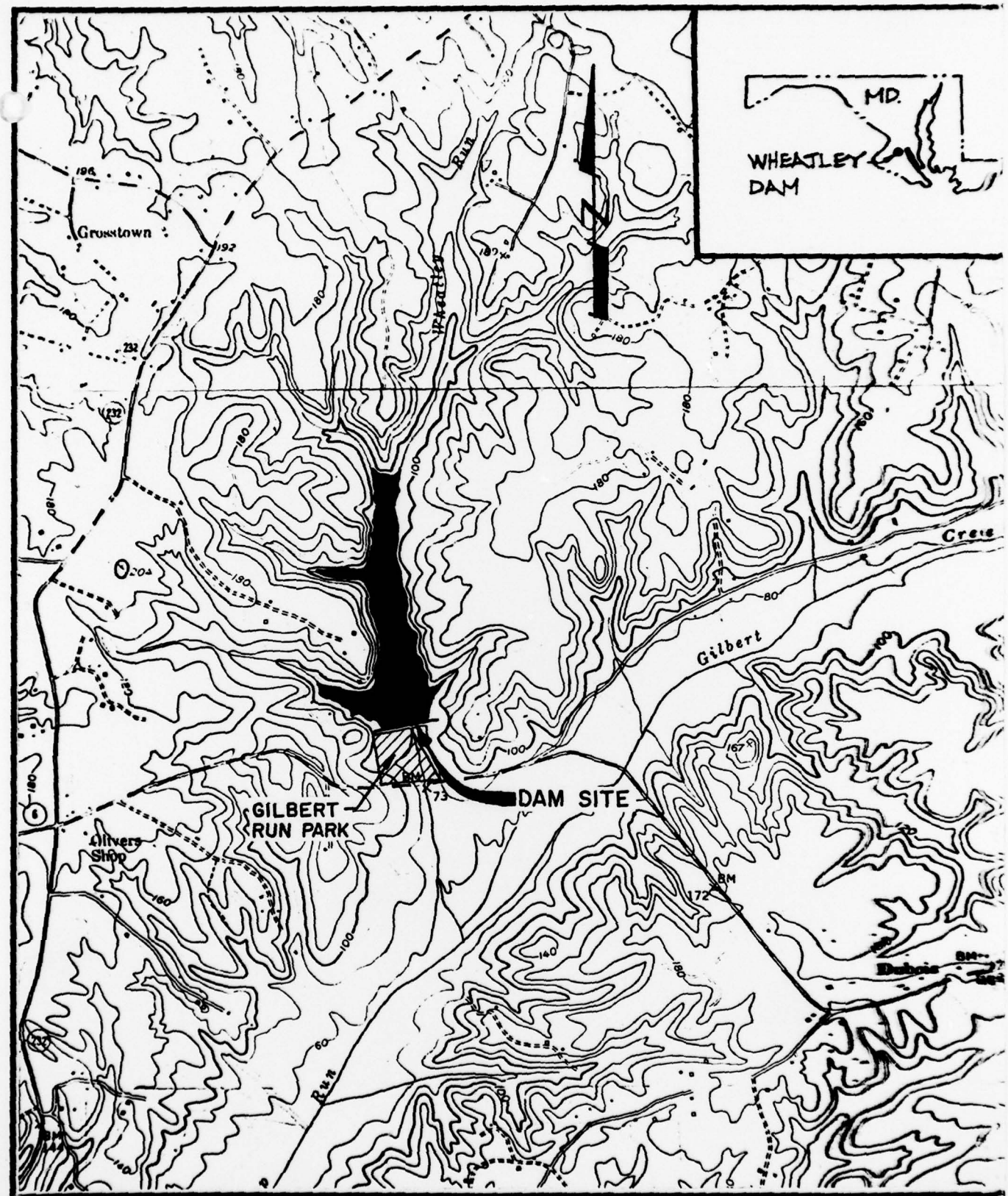
6

7

8

APPENDIX E

REGIONAL LOCATION PLAN



DATE: JUNE, 1979	NATIONAL DAM INSPECTION PROGRAM	LOCATION PLAN OF WHEATLEY DAM SITE
SCALE: 1:24000		
DR: JLM CK: PAD	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS BALTIMORE, MD.	
DWG. NO. E1		

APPENDIX F

REGIONAL GEOLOGY

WHEATLEY DAM
GILBERT RUN SITE NO. 2
NDI I.D. NO. MD 60
REGIONAL GEOLOGY

The Wheatley Dam is located on Maryland's Western Shore within the Coastal Plain Physiographic Province. The dam site is located approximately 4 miles southwest of Hughesville, Maryland, on Wheatley Run and is underlain by the Calvert Formation. The Calvert Formation belongs to the Miocene Chesapeake Group and consists of semi-consolidated beds of clay, clayey silt, sands, and diatomaceous earth. The highly diatomaceous sediments tend to function as an aquiclude. The Calvert Formation is unconformably overlain by the Pleistocene Columbia Group's Sunderland Formation and is exposed in a belt 0.15 to 0.25 of a mile wide surrounding Wheatley Run.

The Sunderland Formation consists of loose sand, silt, and gravel slope wash. The Sunderland Formation is overlain by the Wicomico Formation. The upper portion of the Wicomico Formation consists of clay loam containing gravel layers and scattered boulders. The lower portion of the formation is composed of clay, sand, gravel, and boulders.

The bedding at the site strikes N 38^{o} E and dips to the southeast at approximately 12 ft./mile.

According to the Plan of Geologic Investigation for Wheatley Dam Site, a spring line is located upstream from and in the west abutment along the 78 ft. contour line. A few springs are also present upstream of east abutment along the 78 ft. contour line.

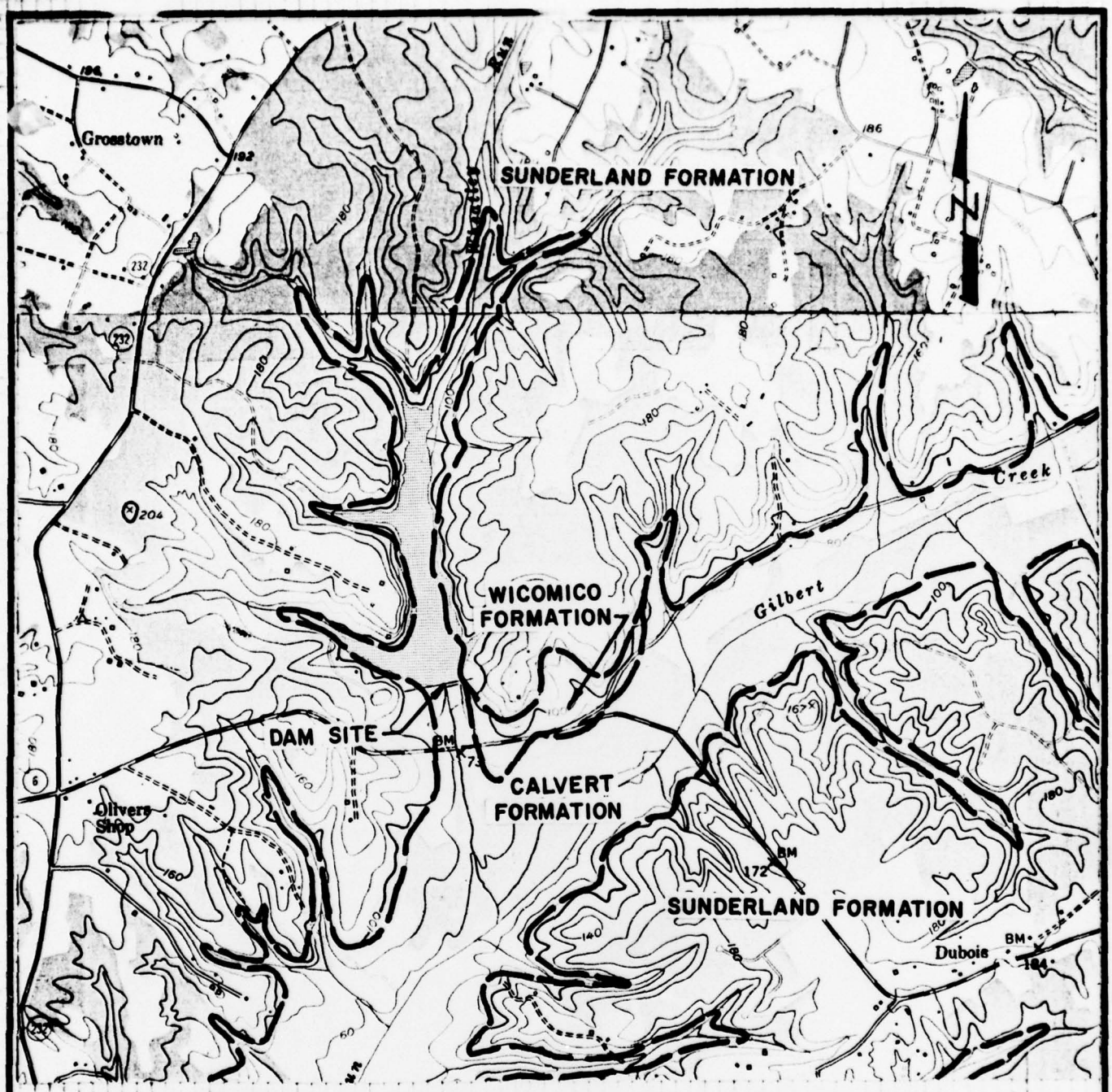
References

Maryland Geological Survey, 1979, Map of Charles County showing Geological Formations.

Glaser, John D., Maryland Geological Survey Investigation #15, Geology and Mineral Resources of Southern Maryland.

Becker, B. C., 1966, Detailed Geologic Investigation of Gilbert Run Watershed (Wheatley Dam) Site #2, Charles County, Maryland.

Becker, B. D., 1966, Plan of Geologic Investigation Drawing No. MD-409-G, Sheet No. 15 of 20.



CHARLOTTE HALL QUADRANGLE, CHARLES COUNTY, MARYLAND

SCALE: 0 ——— 1/2 MILE 1:24000

CONTOUR INTERVAL 20 FT. DATUM IS MEAN SEA LEVEL

——— ——— ——— FORMATION CONTACT

DATA OBTAINED FROM MARYLAND GEOLOGICAL SURVEY'S MAP OF CHARLES COUNTY SHOWING THE GEOLOGICAL FORMATION, 1939

DATE: JUNE, 1979		NATIONAL DAM INSPECTION PROGRAM	SITE GEOLOGY OF WHEATLEY DAM
SCALE: AS SHOWN			
DR: JLM	CK: PAD	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS BALTIMORE, MD.	
DWG. NO.	F 2		